

MINING CONGRESS JOURNAL

FEBRUARY • 1938



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CINCINNATI - MAY 2 » 6, 1938

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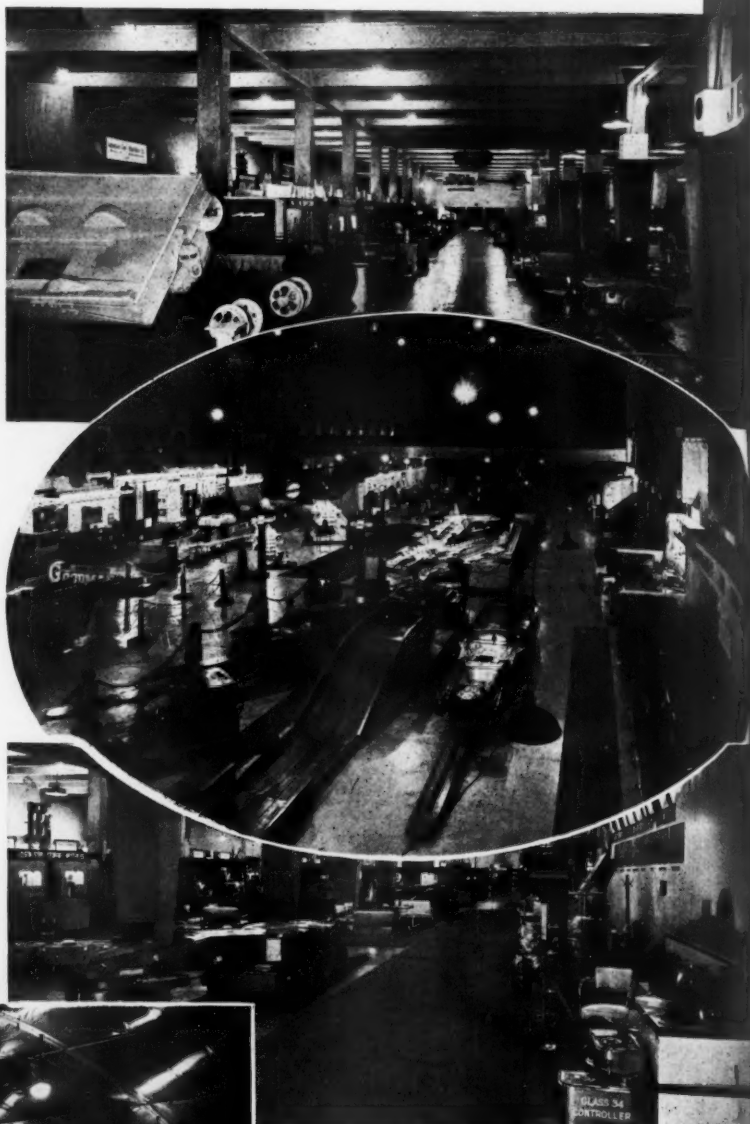
Everything is subject to change—including Conventions. The Annual Coal Convention today is in no sense a luxury. It is a modern necessity — informing, demonstrating and guiding you in the principles and practices that are requisite now to success.

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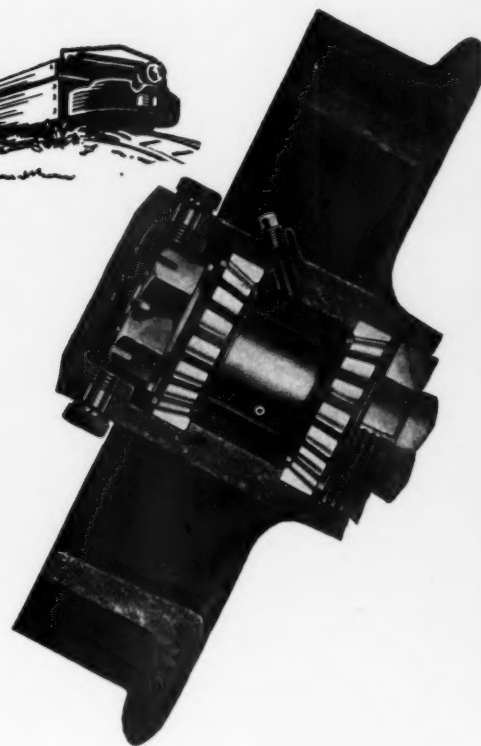
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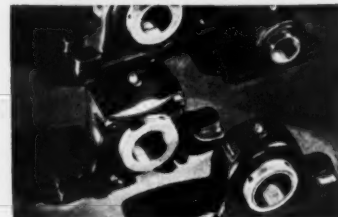
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Picking ore on Apron Conveyor



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There are dozens of applications of Hercules products, besides explosives. Some of these, developed by the company's technical service and research staffs, may interest you. Further information about them can be obtained by writing for "Looking Ahead," the illustrated booklet describing the growth of Hercules Powder Company during its first twenty-five years, and some of the research which the company is doing to meet the future demands of industry.

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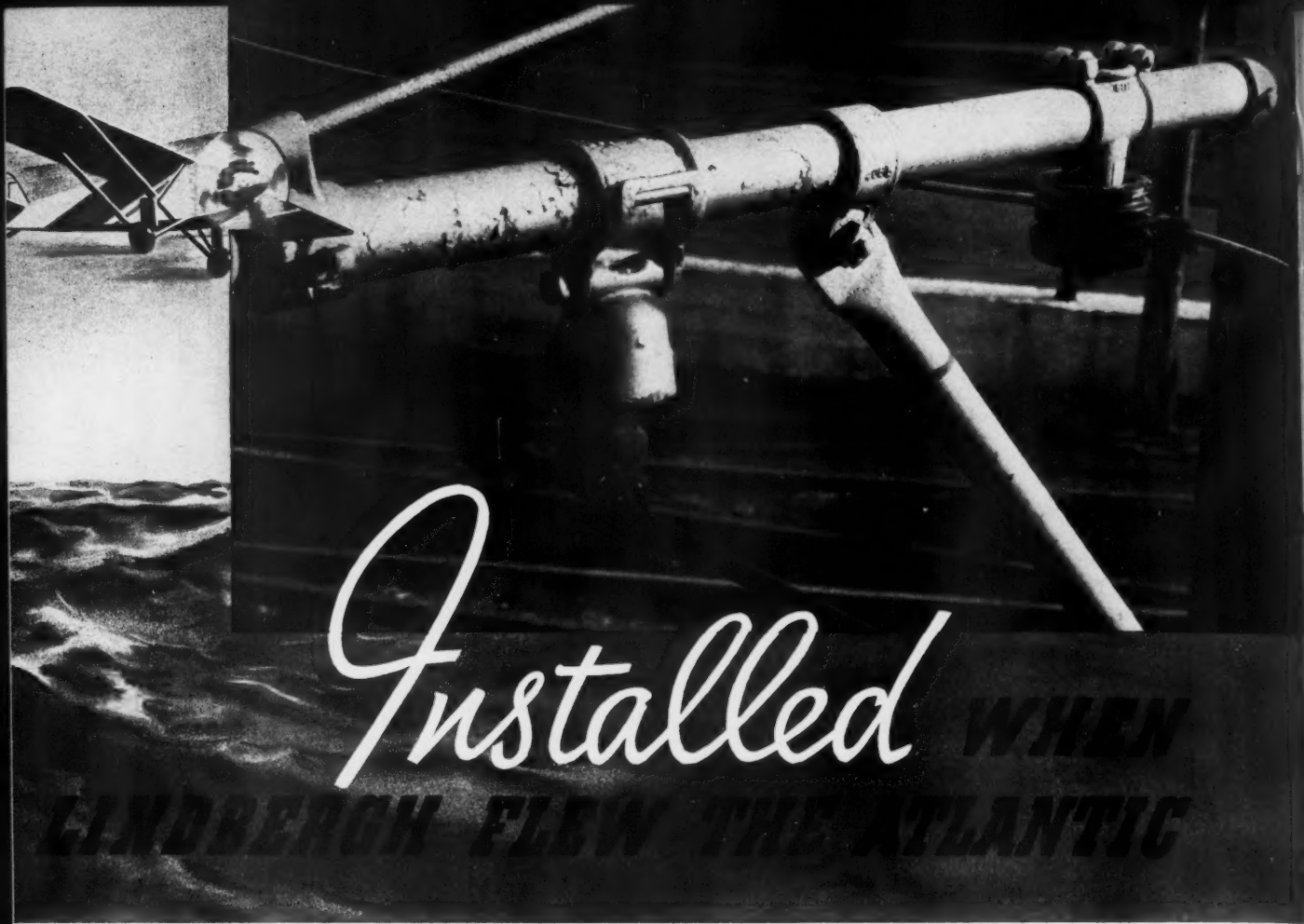
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*Opinions expressed by authors within these pages are their own, and
do not necessarily represent those of the American Mining Congress*

Published monthly. Yearly subscription, United States and Canada, \$2.00. Foreign, \$4.00. Single copies, \$0.20. Entered
as Second Class Mail Matter, January 30, 1915, at the Post Office at Washington, D. C.

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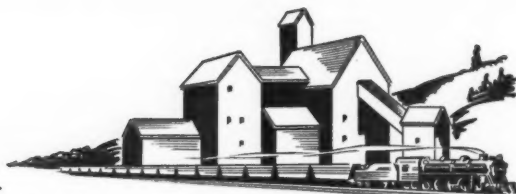
THE AMERICAN MINING CONGRESS

309 Munsey Bldg., Washington, D. C.

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The Bureau of Mines

"**B**E it enacted by the Senate and House of Representatives of the United States of America in Congress Assembled, That . . ."

From this starting point have emanated larger burdens upon the American taxpayer, increasing interferences with the rights and responsibilities of American citizens, more muddling and discouragement, more assumption of power by non-elected agencies, more politics in government and less of business.

Not that all these enactments were wrong; not that many such agencies did not and do not serve a good purpose and fully justify themselves; but few if any do not entrench themselves behind a payroll, long after the specific purpose for which they were created has been fully accomplished.

This may seem a strange expression by one who had to do with the first practical effort to bring about the creation of the United States Bureau of Mines. He still believes that the great mining industry, which up to the year 1910 had no assisting government agency, offered a field for a great public service.

Many investigations in the mining industry, of vast importance to the nation, could not be made by individuals unless the results could be protected by patent monopoly long enough to recoup the costs of such investigations and sufficiently longer to justify the hazards of such enterprise.

The writer still believes that the many metallurgical and scientific problems which then and now confront the mining industry and which could not offer proper compensation to inventive effort, should be solved by the only agency which can act for the direct benefit of all, the government.

He still believes that the great mineral industries of this country need the benefit of the accurate statistical and economic studies which the Bureau of Mines is so ably conducting.

He still believes that the great humanitarian effort to reduce to the minimum the accidents and vocational diseases which were inherent in this hazardous industry, fully justified public aid and that the results in both fields thoroughly warrant continuing public support.

In the field of mine accidents, the loss of life in coal mining operations in 1907 was 6.78 men for each million tons of coal produced. During the year 1936 the loss ratio was 2.72 men per million tons of coal produced, a *reduction of 60 percent*.

In 1906 there were 3,942 men killed in the production of the nation's coal. In 1936 the number of men killed in the same industry had been reduced to 1,330, a *saving for the one year of 2,612 lives*. Upon the cold-blooded dollars and cents estimate of the average jury of \$5,000 for a life—without taking into consideration the human suffering involved—this would amount to a *saving during the year 1936 as compared to 1906 of \$13,060,000*.

Many other agencies are entitled to credit for cooperation but the Bureau of Mines has been the leader, and directly and through the Joseph A. Holmes Safety Association, is still the leading agency in this great humanitarian work.

Space will not permit similar references to the many detailed activities of the Bureau of Mines, each of which is yielding valuable results to the nation.

J. H. Calverath

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Richard J. Lund, Editor

PRINCE OR PAUPER

PERFORMANCE of the steel industry during the last half of 1937 is striking proof that in spite of diversification recently accomplished in the use of its products, the term "prince or pauper" still rightfully applies to it.

Operations in the first quarter of the year were the highest on record. From the peak in March the output had dropped by December to the smallest of any month since September, 1934. This represented a reduction of about 72 percent in monthly output within the short span of nine months—an unprecedented drop in so brief a period.

Space precludes an elaboration of factors contributing to this slump. The fact remains that all the talk heard a couple of years ago about leveling off the peaks and valleys of the business cycle in the steel industry (as well as in many other industries that come to mind) unfortunately has not been borne out by recent history.

BEYOND THE KEN

STATISTICIANS, economists, and sometimes politicians are forever endeavoring to explain just how much our present national debt or even our Federal budget amounts to in terms that the layman can understand. To most of us, however, the sums still remain inconceivably large.

A recent announcement made by Professor L. C. Graton of Harvard University that he had perfected a mineralogical microscope having a useful magnification of 6,000 diameters would not mean much to the average person.

However, the possibilities of such an instrument somehow take on added meaning when it is explained that with such a magnification one can spot a fleck of gold so small that 40,000,000,000 of them are worth only one cent!

Whether it be merely conceiving of such a sum as \$40,000,000,000 or actually seeing a speck of gold so small that 40,000,000,000 of them are worth only a cent, both are beyond the ken of the layman. Even with explanations, such staggering figures remain more or less the exclusive province of scholars and politicians.

JANUARY REFLECTIONS

AS the year's end holidays are left behind, it becomes the unpleasant duty of tax-paying citizens to make an accounting to their government—national and local—of all the items from which tolls are exacted to meet the ever mounting expenses of being governed. It is only natural that a concomitant of this should be an increasing tax-consciousness.

In this connection, recent estimates made by a special committee of the United States Chamber of Commerce of total taxes to be collected in 1938 show an alarming situation. The figures come to a staggering total of \$13,500,000,000 of which Federal taxes would constitute about \$6,400,000,000 and State and local taxes, \$7,100,000,000. This would comprise about one-fifth of the estimated national income.

Merely filling out tax returns covering income, property, capital gains, etc., and making payment thereon is sufficient incentive for a second degree headache. But when figures such as the above bring forcefully to mind that all the additional invisible taxes—actually collected from industry itself but paid for in the end by John Q. Public—added to those paid directly consume 20 percent of our income, one is inclined to call for a bottle of aspirin tablets.

Working almost two and a half months out of the year for maintenance of government is not a pleasant realization.



Mine tippie and washery, Nellis Coal Corporation, Nellis, W. Va.

DEPARTMENTAL METERING an Aid to POWER COST CONTROL

- *Cost of Meter Installations Returned Many Times by Added Information Thus Supplied*

THAT the cost of power constitutes a sufficiently large element in the make-up of total production costs to warrant the closest scrutiny is a fact generally realized by coal operators, and, as with other cost factors, they endeavor to keep this item as close as possible to a predetermined or ideal figure. Paradoxically, however, comparatively few operating men seem to realize the value of a regular monthly analysis of energy use as an aid in the control of power costs.

In the days of the small tonnage mine, where electric power was used principally for haulage, and later for cutting and pumping, the necessity for segregating power use costs was not so apparent. The modern mining plant, however, now includes operations such as preparation, screening, washing, crushing and refuse disposal, that have virtually become separate

By CHAS. W. CONNOR

Superintendent of Mines
Nellis Coal Corporation

departments in the processing of coal. It is just as important to know the actual cost of energy in these departments as it is to have this same information for the several departments of the modern mill or factory. Power consumption is just as much a part of the total cost of the departmental operations as the labor and materials used by them and is just as properly chargeable against them.

Cost-Breakdown Necessary for Comparison

We frequently hear comparisons of power costs of mines made which are by no stretch of the imagination really



CHAS. W. CONNOR

comparable. One mine may be washing and crushing its coal while the other is not. On the other hand the latter mine may have a refuse disposal system, involving the use of power, that the first mine does not have. This indicates that there should be a breakdown of costs into department operations in order to arrive at a comparison that is really worth while. Any

comparison of power costs between mines is practically valueless which does not compare energy used in the same or similar departmental operations.

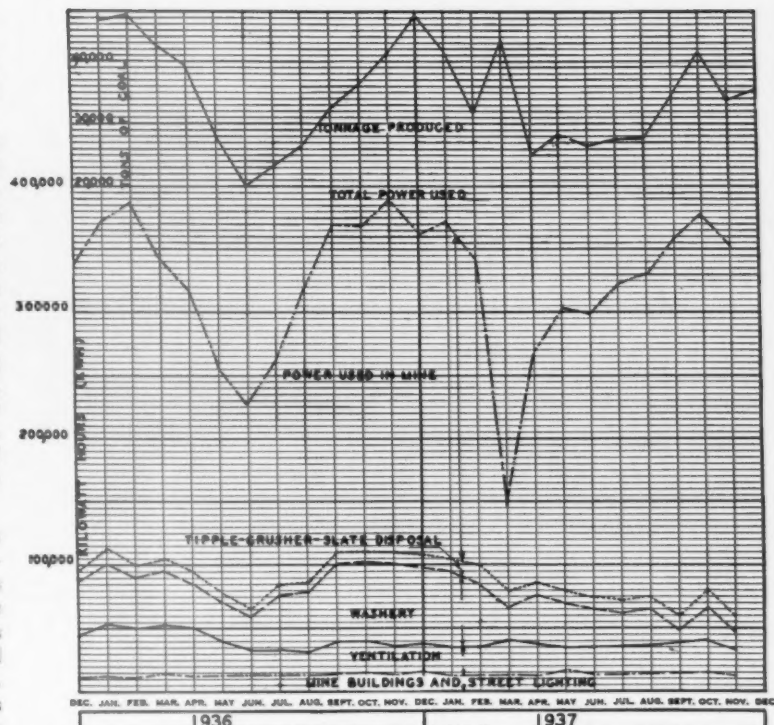
The most convenient means of segregating power consumption is, of course, by the use of meters. For many years the Nellis Mine of the Nellis Coal Corporation, located at Nellis, Boone County, W. Va., has used meters on all branch power lines as a means of determining the energy used in its various operating and processing departments, for allocating properly the resultant power charges, and for securing reliable monthly comparisons that may be used in controlling power costs. A description of methods and procedure will be briefly outlined.

At Nellis power is purchased from the Appalachian Electric Power Company which transmits power over its own lines of 44,000 volts A. C. to the mine. At the mine transformer this voltage is stepped down and metered to the company at 2,300 volts A. C. In addition to the power company's meter, the coal company maintains a meter of the same type at the main transformer station. This latter meter is used solely as a check against the accuracy of the power company's meter, readings being taken at the same time that the power company's readings are made for monthly billing. While no discrepancies have been revealed since the installation of this meter, it has been a source of satisfaction to know that the company has paid for only such current as has actually been delivered to it. Instances are known where meters have gone "hay wire" with resultant losses to the operating company or the power company.

Meters on All Branch Lines

From this point forward through the distribution system meters are used on all branch lines to measure consumption in each separate department. House lighting is accounted for by individual meters. Where current is used for different purposes and different rates are applicable, such as for lighting and domestic ranges, two meters are installed.

Power used in offices, stores, amusement halls and other company buildings is also metered separately. Lighting current is metered independently of current used for refrigeration, ice-making, and other such purposes, and the cost in each case is allocated to the proper accounting charge. Street



Power and tonnage graphs, showing trend of actual energy use in various branch power circuits

lighting is also metered separately and power cost is charged to town expense.

Individual meters record power consumption of the preparation plant, crushing equipment, washery, and refuse disposal, with additional meters to secure a break-down on certain functions performed in some of these departments.

Various Underground Operations Not Segregated

Another meter for the mine fan determines the amount of power used in the ventilation of the mine. All current other than that recorded by these meters goes direct to the mine itself for use in such operations as haulage, mechanical loading, cutting, drilling, pumping, and auxiliary ventilation. It has not been considered practical to secure a further segregation of cost on these operations by metering. The approximate cost of each of the operations has been determined, however, by repeated tests with recording meters and other requisite electrical instruments.

All meters are read each month by an inspector from the electrical department and recorded in a loose leaf meter book which is turned in to the

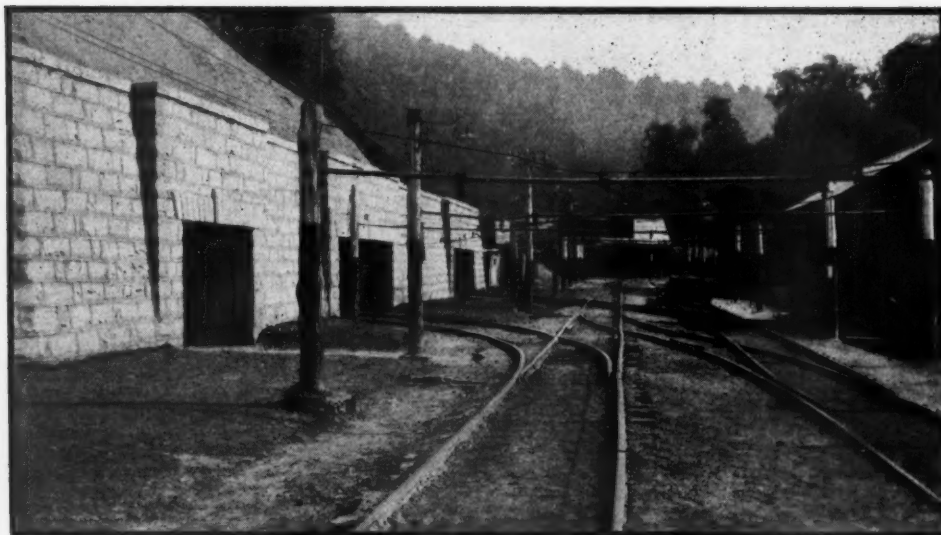
mine office when readings have been completed. While reading meters the inspector has opportunity to observe whether meters are functioning properly, whether seals have been tampered with and whether wiring and connections are in proper condition.

Check Against Main Meter

The total of all branch line meter readings, plus necessary allowances for losses in transmission, gives another check against meters at the main transformer station.

It should be mentioned here that while most of the meters installed are ordinary recording meters, in some cases graphic meters are used, where special attention is important in studies of peak loads and power demand. This applies particularly to the preparation and washing plants.

The metering installation, as described, has been especially valuable, under conditions of varying tonnages and loads, in providing a quick and dependable means of ascertaining just where power fluctuations are occurring and making it possible to correct them without undue delay. Where total energy use and its cost are set up as single lump sum figures, it is almost impossible to identify the de-



Portals of the Nellis mine

partment responsible for any variation which may have caused an increase in consumption and cost except by conducting somewhat lengthy investigations and tests. On the contrary, with metered departments, and with recorded monthly comparisons, either graphic or otherwise, as a guide, the fluctuation can easily be detected and traced to the department responsible. Reasons for the variation can be immediately ascertained, and corrections if found necessary, can be made promptly.

Data Carefully Analyzed

At Nellis, after the meter-book has been checked a report is made up analyzing energy use and cost. This report shows the number of days covered by the meter readings, the

tonnage produced in that period and the total cost of power for the period. The total power used and the total cost of power for each department is also shown. The report further shows for each department the net cost per K.W.H.; the K.W.H. per net ton produced; and the cost per net ton produced. Copies of these reports are furnished to our management and to our electric engineering consultants. As these details are recorded from month to month a valuable record is built up for purposes of comparison and for control of power use.

The accompanying graph indicates very clearly how power use varies with fluctuations in mine production. Nellis Mine was changed from a hand loading operation to a fully mechanized mine on June 1, 1936. Only

three mobile loading units were available at that time and these were triple shifted. The increased power use as additional loading units were put into operation is at once evident from this graph. It also shows that additional power was required during the winter months in the operation of the wet washing plant, tipple, crusher and refuse disposal. It further shows the reduction accomplished in power use for ventilation occasioned by revamping the ventilating system and cleaning up airways.

We know that our investment cost in meters has been returned to us many times over, and feel that we could not forego the benefits now accruing to us through the use of meters in keeping us posted on the details of departmental costs of energy.

Consumers to Get Price Fixing Data

Following the adjournment of hearings on protests by the Consumers Counsel, necessitated January 4 when the Coal Commission refused to supply facts and figures on which it based its price schedules for coal, it was reported that consumers were considering carrying the fight to court. For weeks the Consumers Counsel has endeavored to have the data on which minimum prices were based made available. The Coal Commission has at last agreed to meet their demands

and make these data available to consumers and the Counsel. The Commission late in January made public an order which set a public hearing for February 8 at its hearing room in Washington, at which time the Commission will produce the data upon which minimum prices were based for all districts, excluding district number 21. At this hearing all interested parties are to be afforded an opportunity to be heard.

At the start of the hearings on January 3, Charles F. Hosford, Jr., Chairman of the Commission, asked the Consumers Counsel to proceed

with any protests. When no consumers responded, the Chairman directed that the record note that no consumers were present to submit cases. Three then arose and said that they could not determine whether or not they had been hurt by the minimum prices without the information demanded by the Consumers Counsel. Each of these consumers concurred with the Counsel in the allegation that the prices had been fixed illegally. Since none of them offered to submit any testimony at that time, the Commission postponed the hearing until it had answered their demands.

TIMBERS have been used for roof and track supports since the beginning of mining but it is only within comparatively recent years that permanence in timbering through treating is approaching universal practice.

Some of the oldest tests on record of treated timbers in coal mines date back to 1906 when a number of zinc treated ties were placed in the Silver Creek Colliery of the Philadelphia & Reading Coal & Iron Company. At about this same time a number of zinc treated mine props were placed in a mine in the Allegheny District near Pittsburgh. These ties and timbers were inspected after 25 years of service and reported to be perfectly



Section of main line track with 5" x 7" x 6' ties supporting 60-lb. rail. General practice throughout the mine is as shown—no tie plates used except on switches



Standard sets of bars and legs

TREATED TIES and TIMBERS at ZEIGLER

- *Experience Proves Their Use in Permanent Haulage Ways a Real Measure of Economy*

By J. M. JOHNSTON

Assistant General Manager
Bell & Zoller Coal and Mining Company
Zeigler, Ill.

sound. Chemical analyses of random specimens showed sufficient quantities of zinc chloride remaining in the timbers to insure several more years of service. At the time of inspection it was stated that under the existing conditions as to moisture and temperature the untreated timbers of good grade in the natural state had given a life of four years. No doubt, these treated timbers are still in service.

The history of treated ties and timbers in the mines of Bell & Zoller

Coal & Mining Company is probably very similar to that of many companies. The first treated ties used at Zeigler were placed in Number Two mine in 1922, when a number of zinc treated oak ties were installed in the main line tracks around the bottom of the hoisting shaft. From 1922 to

1927 there were no treated timbers used. In 1927 a small number of zinc treated pine bars and legs were installed. Although the Number One mine was sunk and in operation since 1904, the use of treated timbers was not adopted generally until 1927. Since that time the use of treated ties and timbers has gradually increased until at present treated ties and timbers are used on all permanent haulage ways, and all replacements of broken or decayed untreated timber sets are made with treated timber.

Timber Failures Usually Due to Decay

It is our experience that timbers do not fail ordinarily because of the load they support. Untreated timbers decay and after a few years may fail of their own weight. Treated timbers permanently hold their original size and strength and will remain indefinitely when properly placed.

The method of placing permanent timber sets has been changed very little since treated timbers have been in use. The standard "set" in an entry consists of two legs and a cross bar usually on five foot centers with the bar placed as near the roof as possible. Headers, lagging and wedges of treated oak are driven in above the bars for tightening the set. Timbermen are instructed in the proper method of placing the pieces above the bars so that the load supported will approximate as nearly as possible a continuous load rather than a concentrated load at any one point along the bar. This instruction may or may not be of any value because the point or points of application of the roof load on the bar cannot be determined since it depends entirely on movement of roof for some distance above the bar as well as the rock immediately in contact with the bar.

Timbering where bars are not required consists of a leg and a cap piece or header as shown on the opposite page.

Timbering Entries with Fallen Roof

When timbering entries where roof has fallen, legs up to 10 ft. in length are used. Above this a system of lagging is our normal practice. When the height above the bar is less than six ft., small cribs of lagging are built up close to the ribs on each side and extending from the bar to the roof. The top cribbing is keyed to the cribbing on each side and properly wedged against the roof and sides. Where the top of the fall is more than six ft.

above the first or lowest bar, a sill or plate 4" x 8" x 10' is placed on the top of the bars against the rib, this being at right angles to the bars. Another set of legs and bars are placed above the bottom set with the legs resting on the sill against the ribs. This is repeated until within less than six ft. of the top when the lagging as described above is placed above the last set to complete the support. This method requires less timber and allows an opening through the center for free passage of air. It also allows a convenient area for inspection to the topmost timber. Entries having falls up to 30 ft. have been timbered in this manner and have stood for a number of years in good condition.

Some changes in size have been made since 1927. Smaller timbers are now being used with good results. The specifications on treated timbers originally were:

Bars, 12' long, 9" tip
Bars, 14' long, 9" tip
Bars, 16' long, 9" tip

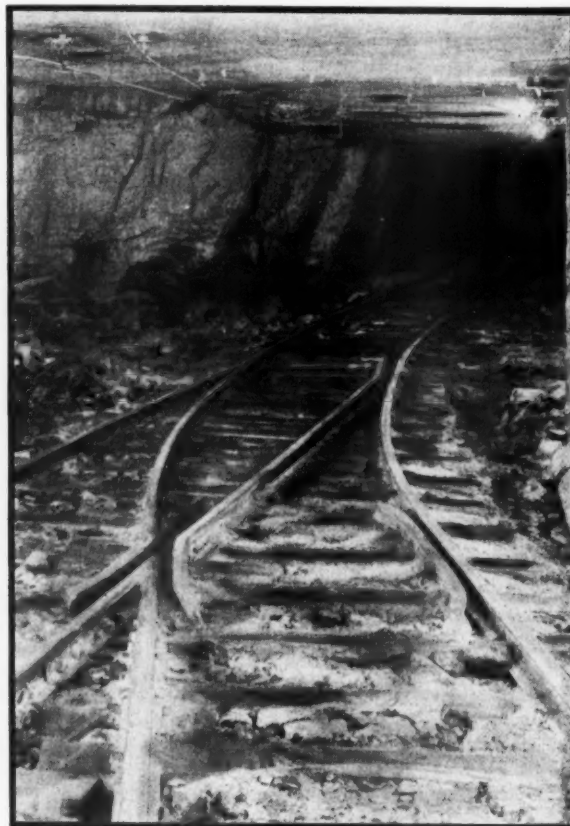
Legs, 7' long, 9" tip
Legs, 8' long, 9" tip

In 1931 these specifications were changed and orders placed for:

Bars, 12' long, 7" tip
Bars, 14' long, 7" tip
Bars, 16' long, 8" tip
Legs, all lengths, 7" tip

Size Reductions Effected Economies

This change in specifications resulted in a substantial saving because the price of raw timber in this field is based largely on the cubical contents of the wood in the piece plus the cost of labor for cutting, trimming, peeling and otherwise preparing it for market. Also, there was additional saving shown in the unloading, handling and placing of the timber sets. It was found, also, that the reduction in size of timbers did not result in failures from loading; in fact, our records show failure on only two cross bars due to load. We have no record of a leg failing from load.



Treated switch ties that have been in service since 1922

Painting or Treating Cut Areas Discarded

For some time after treated timbers were used generally, an effort was made to paint all freshly cut surfaces made in framing the sets. Later a solution of water and zinc salts was used instead of paint. This practice was carried on in more or less delinquent manner until 1933 when it was dropped altogether. We now make no attempt at painting or treating ends or fresh surfaces but depend upon the original treatment to permeate far enough into the wood to protect the timber from decay due to air and moisture. To date there has been no noticeable decay in treated timbers where cutting and sawing was required in framing.

Excellent Results from Treated Ties

Treated ties came into general use along with treated timbers. Prior to 1930, pine, gum and oak ties treated with zinc chloride were used. It was found that pine ties did not hold the

spikes, especially on curves, and in many places failed because of derailments or mechanical wear due to loose spikes. Gum ties failed on account of dry rot. Gum wood decays rapidly and must be properly handled during the entire process from stump through treating plant. When cut in the right season, held in the seasoning racks the correct length of time and properly treated, gum ties often give good service.

Since 1930 all the new main haulage and panel tracks have been laid up with zinc treated oak ties. Main line ties are 5" x 7" x 6'-0". Panel entry ties are 4" x 6" x 5'-6". The ties are spaced 20" to 24" with no tie plates except at the switches. Mine refuse is used for ballast.

Replacements of treated ties have been very few. Approximately 300 altogether have been taken out. When considering we have 21 miles of track on treated ties this number represents only a very small percentage of failures. Most of these replacements have been pine and gum ties which failed as stated above.

The list of treated timbers as now used in our mines consists of:

Treated Pine Legs

7' long	with 5" tip
7'-6"	with 5" tip
8'	with 5" tip
8'	with 6" tip
8'	with 7" tip
9'	with 7" tip

Treated Pine Bars

12' long	with 7" tip
14' long	with 7" tip
16' long	with 8" tip
20' long	with 8" tip

Treated Oak Ties

5" x 7" x 6'-0"
4" x 6" x 5'-6"

Treated Oak Header

Blocks 5" x 7" x 3'-0"

Treated Oak Lagging 3" x 5" x 5'-6"

Treated Oak Cap

Pieces 1/4" x 0" x 7" x 12"

The yearly requirements of all treated timbers not including cap pieces, is approximately 132,000 pieces. A substantial saving in mining cost is represented here when considered from the standpoint of expected life of the treated timbers against that of untreated timbers. We consider treated timbers in all permanent haulage ways as a measure of economy that pays real dividends as the life of the timber extends beyond that of untreated timbers under similar conditions.



Legs with header blocks are used where bars are not needed

Power Engineers to Meet in Atlanta

Several hundred power engineers from Florida, Georgia, North Carolina, South Carolina and Tennessee will meet in Atlanta, Ga., February 8, for a fuel engineering conference sponsored by Appalachian Coals, Inc., Cincinnati, Ohio, marketing agency for over 40 million tons of bituminous coal produced annually in the high volatile districts of Kentucky, Tennessee, Virginia and West Virginia. The engineers will participate in an all-day meeting, the twenty-second in a series, during which nationally known authorities will discuss important phases of application and utilization of industrial coals.



Fig. 1. Four drum hoist for multiple rope haulage at the south shaft of the See Sah mine, Commerce Mining & Royalty Company

MULTIPLE ROPE HAULAGE in the TRI-STATE DISTRICT

- *Not Claimed a Cure for All Haulage Ills, But Will Yield Economies Under Favorable Conditions*

THE installation of an underground haulage system at the See Sah mine of the Commerce Mining and Royalty Company offered several problems due to the unique type of the ore deposit.

This ore body reverted back to the so-called "sheet ground" type which was typical of the Joplin - Webb City, Mo., fields; and occurrence of this type of ore in commercial richness in the Picher, Okla., field is the exception rather than the rule.

The thickness of the ore body averages about 7.5 feet, distributed in a rough circular shape about 600 feet in diameter. Owing to the nature of this formation it was necessary to drill

By S. S. CLARKE

Superintendent of Mines
Commerce Mining & Royalty Co.

out a round completely, as there were no fractures or vugs to break to, for relieving the burden, and the holes had to be well loaded to insure proper breakage. It was determined that the heavy concussion, which was emphasized by the shape of the mine acting as a sounding board, was dangerous to livestock, and animal haulage was discarded. The narrow gauge of the mine tracks (18") eliminated locomotive type of haulage, as this gauge

would not permit the locomotives to be used in other mines when the See Sah was depleted.

Four Lay-Bys Served

The conventional type of tail rope haulage was discussed, at which time the mine was nearly circular and some seven or eight lay-bys would have to be served. Snatch lines could not be planned, and two hoists would increase operating costs. A four drum hoist (Fig. 1) was designed and assembled in our shops using cone friction drums from discarded geared hoists. The mine tracks were rearranged and the lay-bys reduced to four. The hoist was set as close to the shaft as possible. The two forward drums served one end of the mine, with a snatch line serving an adjacent lay-by. The two rear drums served one lay-by in the opposite end with an auxiliary snatch line from a second

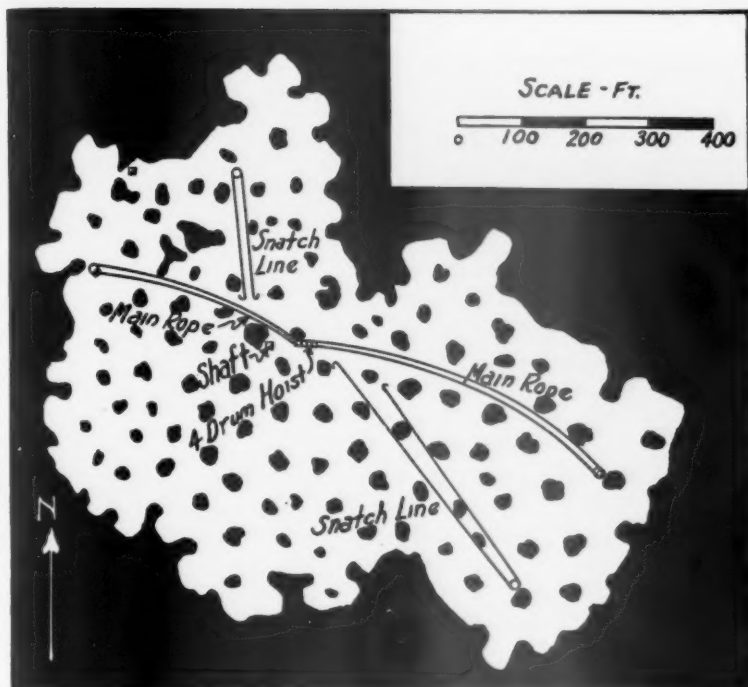


Fig. 2. Plan of workings and rope haulage at the See Sah mine

lay-by. (Fig. 2.) Several more lay-bys can be served with additional snatch lines if necessary. At an adjoining mine five snatch lines, including one lay-by requiring tandem snatch lines, work from the main rope very successfully (Fig. 3).

A speed of 400 ft. per minute was decided upon as a tryout, as some doubt was expressed as to the success of this type and we did not want to prejudice the crew by causing wrecks or personal injuries by using too fast a rope speed until all the "bugs" were out. After it was in successful operation for some weeks the speed was increased to 500 ft. per minute which was ample to keep the shaft hoist to capacity.

Trips of 15 cans each are pulled. Each can contains 1,200 lbs. of mine rock. The main lines were laid with 30-lb. rails, thus giving more bearing surface for the wheels which reduced tip-over wrecks due to the cans starting to rock as a result of the wheels becoming grooved from use on 8-lb. or 12-lb. rails.

Two men constitute the haulage crew, one hoisting engineer and one rope rider. Signal cords are run parallel to the tracks within easy reach of the rope rider so he can be in code communication with the engineer at any time.

FEBRUARY, 1938

Improvised Sheaves and Idlers

The tail rope sheaves, or bull wheels, are 24" discarded hoist sheaves mounted in a timber frame and either wedged to the roof or keyed into a pillar or wall. Where the bull wheel is apt to be destroyed by blasting, they can be set below rail level horizontally and work just as well. The tail rope is carried to the bull wheel on 8-in. sheaves mounted in stirrups and fastened in holes in the roof with wedges, or if the roof is too high the stirrups are fastened to wooden posts well braced. Idlers to support the pull-in rope and carry the back drag line are usually 4-in. pipe with $\frac{3}{4}$ -in. spindles. Idlers to take the rope around curves are old mine car wheels set at about 30° angle and spindled to a 10"x10" block of wood. A new type of idler consists of a cone with a double taper. These are 4 in. in diameter in the center and taper outward to an 8-in. diameter at each end, and are 14 in. high. These idlers have been christened "Mae West," and that name is now a part of the track man's vocabulary.

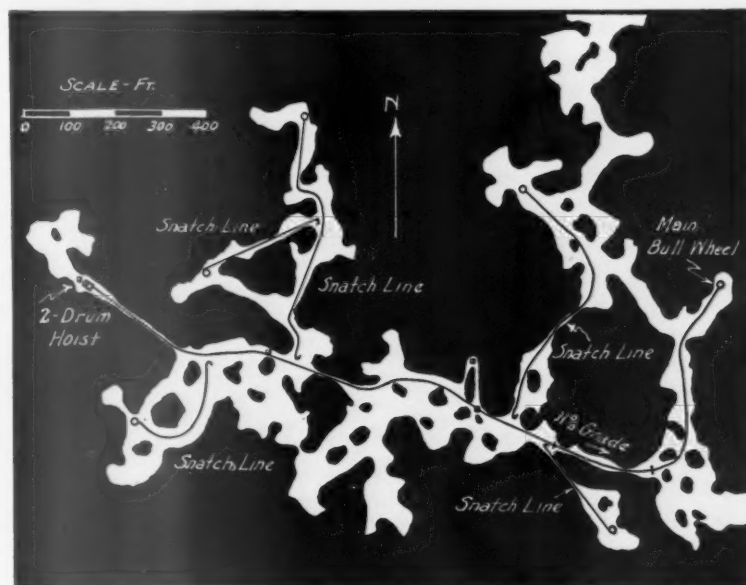


Fig. 3. Five snatch lines successfully used in rope haulage at the Jay Bird mine of the Commerce Mining & Royalty Company

Turn sheaves at snatch line junctions are made from old hoist drums (14" diameter) mounted on a vertical shaft and they make an excellent sheave.

This mine is averaging about 710 cans per eight-hour shift, equivalent to 426 tons hauled by an operating

crew of two men, which gives a man-shift output of 213 tons as compared to from 77-148 tons per man-shift made by other types of haulage used in mines of about the same tonnage output in the district.

Flexibility of Multiple System

The flexibility of the multiple system lends itself readily to grades, curves, and side headings. Fig. 4 shows a four-drum installation at our Blue Goose mine, and Fig. 5 the complete layout. The west ropes go down a 13 percent incline 200 ft. long to a lower level, then the track flattens out for about 600 feet, after which it goes up an 18 percent slope 300 ft. long to a top level. This particular set-up eliminated two incline hoists and one mule in the north end of this mine. An upper level is served by a 12 percent slope 200 ft. long, a side track and snatch line passing under this slope to serve an intermediate level.

In starting operations on the inclines considerable trouble was encountered, due to lack of experience



Fig. 4. Four drum hoist for rope haulage at the Blue Goose mine, Commerce Mining & Royalty Company

as to the proper speed and rope tension to maintain in coming down the inclines. The pull-in cable could not keep out of the way of the trip and the trains would over-run the cable, generally causing a bad wreck. For a while it was very discouraging, and consideration was given to setting small hoists at the top of the inclines. A better type of brake was then designed, which, with additional experience of the crew, has resulted in no more trouble on the inclines than on level tracks.

Economies Over Mule Haulage

A comparison of man output (haulage operating crews) from eight mines of practically the same tonnage gives the following results: Two mines using

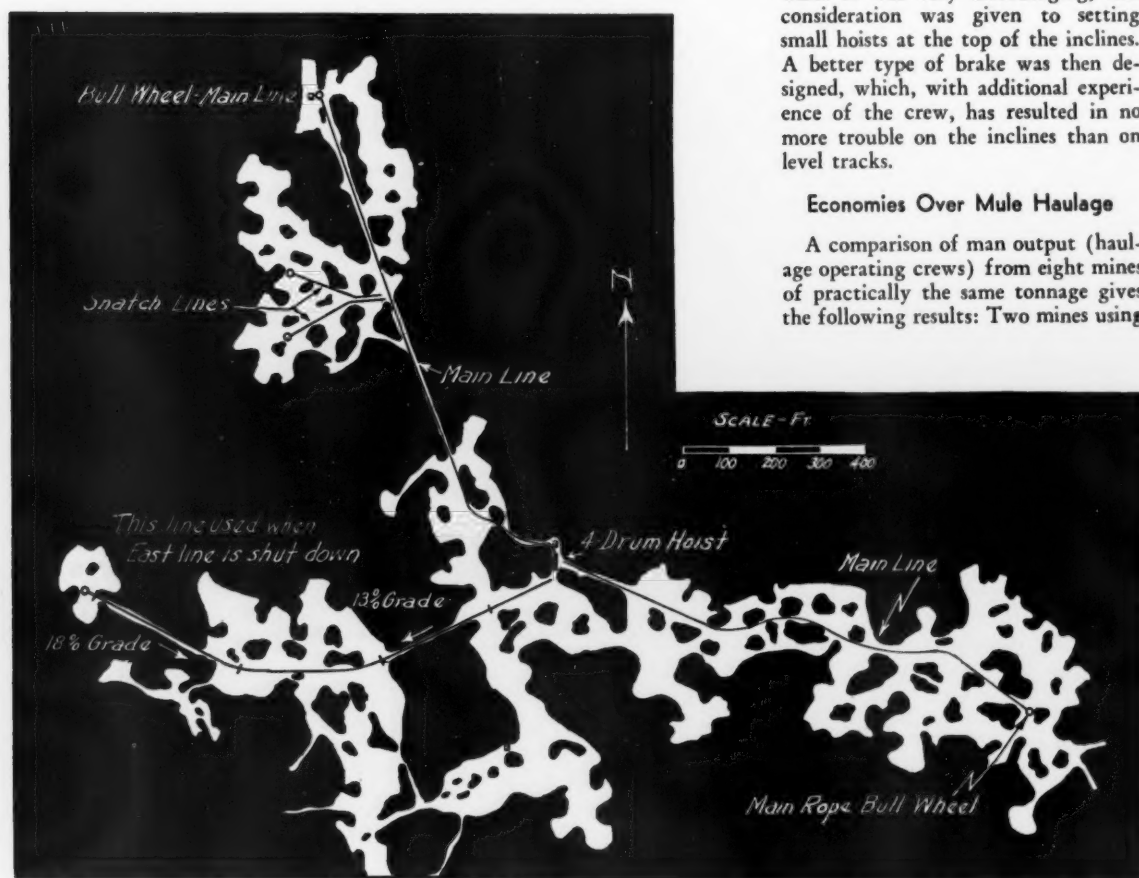


Fig. 5. Complete layout at Blue Goose mine. Grades caused initial difficulties in rope haulage here

multiple rope haulage have an output of 191 tons per man shift employed on operations only. Three mines using the conventional two-drum tail rope haulage give an average of 220 tons per man-shift. One mine using a locomotive in connection with mules and an incline hoist, and two mines using mules and incline hoists give an average of 113 tons per man-shift.

In one mine the multiple system is not completed and two mules are still in service which reduces the tons per man-shift some 35 or 40 tons. The two-drum system shows a higher figure than the usual expectation, due to one installation being nearly a perfect set-up owing to the shape of the ore body, and one man can handle the entire output.

Labor and Power Costs per Ton Hauled

	Multiple System	2-Drum Haulage	Average of Other Types
Labor	\$0.0251	\$0.0256	\$0.0449
Power	0.0046	0.0068	0.0084

Rope wear is close to \$.009 per ton. When the main line ropes are discarded they are used on snatch lines.

Maintenance labor is about the same at all mines. Repairs and supply



Fig. 6. A trip of cans at the Blue Goose mine under trestle leading to upper level

costs used directly on haulage are not segregated from total haulage maintenance which includes repairs, cans, cars, etc.

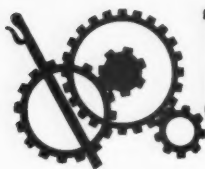
One particular mine that had a very high haulage cost due to the irregularities of the ore body had a labor cost of 10 cents per ton and an efficiency of 45 tons per haulage man shift before the installation of the multiple system (which is still not

completed). The labor costs were reduced to 5 cents per ton and efficiency was raised to 94 tons with every indication that further reduction will result upon completion.

We do not wish to convey the impression that the multiple rope is a cure-all for haulage ills, but under conditions to which it is adapted it will give better costs and service than other types.



Air view of part of the Tri-State district, with Bird Dog central mill of Commerce Mining & Royalty Co. in foreground



MECHANIZATION Trends

DEWATERING and DRYING WASHED BITUMINOUS COAL

• *A Report of the Coal Division of the American Mining Congress, submitted by the Committee on Surface Preparation*

DURING the past two years the Surface Preparation Committee of the Coal Division of the American Mining Congress has been collecting data on dewatering and drying washed bituminous coal at representative plants in the Eastern and Central Bituminous Fields. Nine reports have been submitted and these, with more or less data from 10 or 12 other plants, have been summarized and are included in whole or in part in this report.

One of the serious problems of wet-washing small coal is the necessity of eliminating the *surface moisture* added by the washing, to an extent sufficient to meet market requirements in each case. The moisture as received must not be seriously objectionable to the user, as it affects his B.t.u. cost, his cost of handling, or the capacity and reliability of his plant. The requirements vary widely with different users.

Definition of Terms

The following are not offered as definitions for general acceptance, but merely to define the sense in which these various terms are used in this report.

The term *total moisture* is used to refer to all moisture found in a coal sample which may be driven off by standard methods of test at temperatures up to and including 110° C. This frequently includes both bed and surface moisture, but, under some circumstances, might include only one or the other.

The term *bed moisture* is used to refer to the moisture, or water, which is an integral part of the coal substance in its natural or unexposed

condition in the seam, and which can be driven off in testing at temperatures up to and including 110° C. This is, of course, exclusive of surface moisture, and is also frequently referred to as *inherent moisture*. (See U. S. Bureau of Mines TP 76, pp. 23-25.) It should be approximately equivalent to the moisture shown by samples properly taken and tested from freshly exposed faces of the coal bed which have not lost moisture by drying, nor been in contact with free water or moisture from extraneous sources, including water from crevices of the coal, the surrounding strata, or condensation from air currents, etc.

The term *surface moisture* is used to refer to water or moisture (other than bed moisture or replacement of bed moisture) which is included with, and on the surfaces and in crevices of, and between the pieces of the coal which is being tested.

The term *dewatering* is used to refer to the removal of moisture from the coal in the form of water, by gravity alone, or with the aid of one or more of the many mechanical devices that are used. Obviously dewatering can only remove less than all of the extraneous or surface moisture and none of the *bed moisture*.

The term *drying* refers to the removal of moisture by evaporation or in the form of vapor. It accounts for slight moisture reduction during mechanical dewatering, but is more important during drainage periods and while coal is in transit, depending upon temperature, humidity, winds, etc.

The term *heat drying* refers to drying by the application of artificial heat.

Measuring Moisture

In marketing coal a matter of particular interest is the percentage of moisture *as received* by the user. This includes both bed and surface moisture. Both affect the delivered B.t.u. cost, but high surface moisture causes trouble due to freezing, clogging in bins and chutes, etc. In some cases a change of 1 percent in surface moisture may cause or eliminate such troubles. It is therefore important to have an accurate measure of surface moisture from a marketing standpoint, as well as for measuring, comparing and controlling the results of dewatering.

Since bed moisture varies widely from bed to bed, and only surface moisture can be reduced by dewatering, it is desirable to eliminate the bed moisture from dewatering data, and to have for comparison figures which represent only the percentage of surface moisture remaining in the coal when the dewatering, or a given stage of the dewatering, is complete.

Standard methods are provided by ASTM D21-16 for taking moisture samples, and by ASTM D271-30 for laboratory determination of "total as received moisture," also ASTM D388-34T specifies the Stansfield and Gilbert method for determining the "standard condition of moisture equilibrium," which is supposed to be equivalent to the bed or inherent moisture. Presumably the difference between bed moisture by this method, and total moisture by D271-30, would give us surface moisture. No doubt in many cases this would be close enough for practical purposes, but if, for example, a coal from pillars had lost, say, 5 percent of its bed



moisture when it came to a washer, it is doubtful whether the large sizes particularly would take up the deficiency while passing through the washer and dewatering equipment. If not, the difference between bed moisture and total moisture would be correspondingly less than the surface moisture actually held by the coal.

A difference between total moisture in the feed to a washer and total moisture in the dewatered product would be *greater* than the surface moisture if the feed had lost a part of its bed moisture and if it took up the deficiency during the washing and dewatering. It would be proportionately *less* than the surface moisture if the feed contained surface moisture.

For example, let us assume that three plants dewatering a given size of coal on units of the same type report: (1) Total moistures in feed of 5, 7, and 9 percent, respectively; and (2) total moistures in products of 6, 9, and 15 percent, respectively. These figures alone would indicate a wide variation in the dewatering efficiency of the three plants, but if we knew that the bed moistures in the coals were approximately 3, 6, and 12 percent, respectively, we would find that in each case the surface water remaining after the dewatering was approximately the same. It would also be apparent that the feed to the first two plants had more than bed moisture, while that of the third plant had dried out materially before reaching the washer, and that it had taken up the deficiency.

In sampling, moisture may be lost while collecting the sample, or in crushing and reducing the gross or the laboratory sample, without air drying.

Authorities agree that the ASTM "air-drying loss" cannot be depended upon as having any definite relation to either the bed or the surface moisture of the coal, but is merely used to bring the coal into equilibrium with the air while the sample is reduced, etc.

Stansfield and Gilbert, in Table 4, page 137, AIME Transactions, Volume 102, 1932, show air-dry moistures determined on 21 samples crushed to pass 14 M, each of a different coal ranging from 3.8 to 33.0 percent bed moisture. These air-dry moistures determined under controlled temperatures at 30° C. and 60 percent humidity, ranged from 58 to 88 percent of the true or bed moistures of the coals.

They give other data showing that with lower humidity the air-drying

loss is greater, and with higher humidities it is less; but most important they show that samples having slightly more or less than their true bed moisture will reach an equilibrium at approximately their true or bed moisture when left for 48 hours in a vacuum dessicator at 30° C. and 97 percent humidity. This is the test previously referred to in this report as specified in ASTM D388-34T.

The Stansfield and Gilbert data and a comparison of air-dried moistures with bed moistures given in Bureau of Mines publications of coal analysis indicates that air-drying losses without control of humidity are apt to include from 10 to 80 percent or more of the bed moisture, depending upon temperature, humidity and time of drying.

Where air drying is done without control of either temperature or humidity, it seems probable that the results would be still more uncertain. At some plants wet samples are placed over a hot plate or other source of intense heat and stirred until they "appear dry." The drying loss is taken as surface moisture. So far no data are available as to the accuracy of this method, but it seems possible that within some range of size of sample and size of coal, it might be more accurate as a measure of surface moisture than air drying without control of temperature or humidity, or with control of temperature, but not of humidity.

Oven drying the uncrushed samples at high temperature, 85° to 110° C., and adding an average correction, determined for that method and coal, for the residual moisture is probably sufficiently accurate for total "as received moisture" in some low-moisture coals. In such cases deducting an average figure for bed moisture should give a value for surface moisture correct within reasonable limits. This probably would not be satisfactory for coals having bed moistures above 5 or 6 percent.

The methods of taking and reducing moisture samples and of determining the moisture vary widely from plant to plant, and in many cases the results are subject to serious error.

Further studies should be made with a view to combining the best features of the various methods which are being used to obtain moisture control data, in order to develop a standard method which is quick, and does not require expensive apparatus or a high degree of skill, and which will give surface moisture results accurate within 1 percent nine times out of ten.

Moisture Data in This Report

In securing the data on methods and performance a special effort was made to get enough information as to the method of sampling and determination of moisture reported so that the figures might be adjusted to give a reasonable basis of comparison of surface moisture.

Where the figures are reported to represent surface moisture only, they have been taken without correction. Where total moisture is reported, the bed moisture has been deducted and the difference taken as surface moisture. Where oven-dried results are reported, corrections based upon the data in each case have been applied to give surface moisture. These figures are used for the comparisons in the tables and discussions in this paper.

Methods of Dewatering

In the simplest methods of dewatering the water is merely given an opportunity to drain by gravity from the coal, as in elevators, conveyors, gravity screens, or in bins or railroad cars, etc. For more difficult requirements drainage is accelerated by shaking or tumbling the coal, moving it in a thin layer at high velocity over the drainage surfaces, as on shaking or vibrating screens; centrifugal force, suction or blasts of air may be utilized as with centrifugal dryers, filters, or blowers, respectively. Such dewatering units are used singly or in combinations, and in series or in parallel, depending chiefly upon the size and quantity of coal and the thoroughness with which the moisture is to be eliminated.

The rapidity and thoroughness of the drainage depends to a large extent upon the size and surface characteristics of the pieces of coal. If all the pieces are large, they are easily retained on surfaces with large openings, permitting rapid drainage.

With the presence of smaller pieces the drainage openings must be correspondingly smaller, thus offering less opportunity for the water to escape. At the same time, in a given quantity of coal, the surface available to hold water increases rapidly as the size of the pieces decreases (approximately as the reciprocal of the size, see Fig. 1). In small coal, water is also held between the particles. It follows, therefore, that a large percentage of the wash water may be quickly and rapidly separated from the large sizes, if they are free from fines; and that the percentage of wash water which



may be removed decreases, and the time and the equipment required for such removal increases progressively with the presence of smaller particles and with the percentage of such particles.

Surfaces which are smooth, solid, and clean hold less water than those which are irregular, granular, full of crevices, or covered with sludge.

Classification of Data

A study of the reports and other data available shows that the conditions, operating practices, sampling methods, etc., vary to such an extent that it is very difficult to classify the data with regard to size of coal, type of equipment used, or as to results.

In most cases dewatering is combined with the screening and sizing of commercial products. Frequently the required commercial sizes are one of the controlling factors in the range of sizes washed together, as well as the range of sizes dewatered on the same units. Large sizes are usually sufficiently dewatered during the operation of sizing or rescreening them as commercial products.

With the intermediate and fine sizes it is usually necessary to pass the coal successively over a number of dewatering surfaces in order to reduce the moisture to the required point. For comparing the results of given methods or equipment, the data must cover similar tests on products having a similar size range.

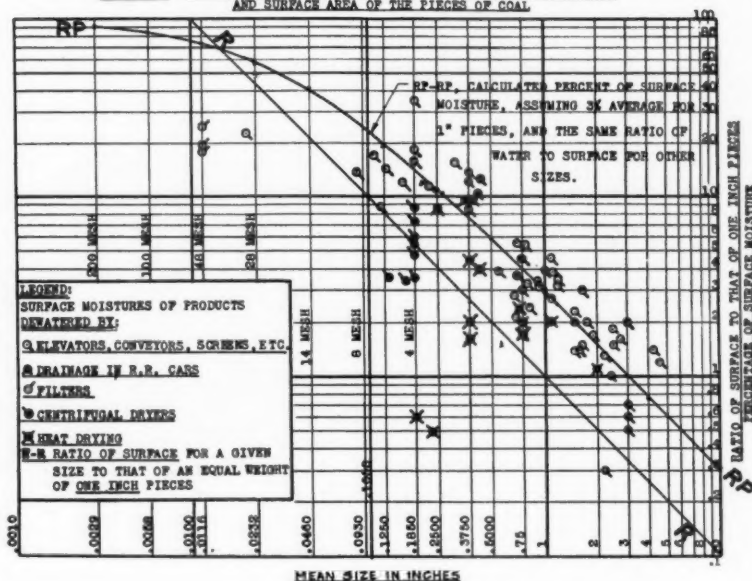
Moisture to Surface Relationship

The data from committee reports and other reliable data have been plotted on Figure I, showing surface moisture for each product in relation (1) to the mean size * of the product and (2) to the theoretical relationship of surface units to mean size of product.

The results shown for mean sizes $\frac{1}{2}$ in. or larger are from commercial products reasonably free of $0 \times \frac{1}{4}$ -in. sizes; for example, 4 results on 2-in. \times 4-in. products are shown at 3 in. on the mean size scale with surface moisture ranging from .5 to 2.0 percent. Twelve results on approximately $\frac{1}{4}$ -in. \times $\frac{1}{4}$ -in. products are shown at or near .75-in. mean size with surface

* Half the sum of the round hole equivalent of the screen openings is taken as the mean size of the product. This is usually larger than the mean size calculated from a screen analysis, but it seems to fit better with the surface ratio.

FIGURE I. RELATION OF PERCENTAGE OF SURFACE MOISTURE TO MEAN SIZE AND SURFACE AREA OF THE PIECES OF COAL



moisture ranging from 1.8 to 5.5 percent.

Results on commercial products from $0 \times \frac{3}{4}$ -in. are shown at mean sizes from .12-in. to .375-in. for dewatering by elevators, screens, etc.; drainage in railroad cars (48 hours); centrifugal dryers; and by heat drying.

Theoretically the aggregate surface per unit of weight varies as the reciprocal of the mean diameter or size of pieces. This means that a ton of .1-in. or .01-in. pieces should have 10 or 100 times, respectively, as much surface as a ton of 1-in. pieces. This ratio is shown by the line R—R.

The line RP—RP shows theoretical percentage of surface moisture, assuming 3 percent for 1-in. pieces (the Fig. I average), and the same ratio of water to surface for other sizes.

It is interesting to note that the results on Figure I between mean sizes .12-in. to 4.5-in. make a band paralleling the line RP—RP. Therefore, Figure I gives for any product having a mean size from .12-in. to 4.5-in. a range within which its average surface moisture may be expected to fall.

The assumption of the same ratio of water to surface is evidently not correct, as it is obviously impossible for .01-in. pieces to hold 3.09 pounds of water per pound of coal, which is 100 times that for 1-in. coal at 3 percent average surface moisture. Therefore, Figure I indicates that plus $\frac{1}{8}$ -in. sizes have a much greater capacity per surface unit to hold water than the very fine sizes.

Size Ranges—Table I

With the aid of Figure I the data have been tentatively classified into five size ranges, A to E, inclusive, using the mean size for each product. An effort has been made to have each classification bear some relationship to the method and equipment used, as well as to size of pieces and the surface moisture obtained in the product.

The classification of Table I are briefly described as follows:

Size Range A: (Large Coals), Mean Size $1\frac{1}{2}$ in. to $4\frac{1}{2}$ in.

This includes commercial products with an average size of $1\frac{1}{2}$ in. or more that are reasonably free from minus $\frac{1}{4}$ -in. material. For example, this would include $\frac{1}{4}$ in. \times $2\frac{3}{4}$ in., $\frac{1}{2}$ in. \times $2\frac{1}{2}$ in., 1 in. \times 2 in., and larger sizes up to 3 in. \times 6 in. Where these sizes are shipped reasonably free from minus $\frac{1}{4}$ -in. material the dewatering which takes place on the sizing and rescreens is usually sufficient, as coal in these sizes drains rapidly, and except in very cold weather, usually arrives at destination with little or no increase in moisture due to washing. In some plants only a gravity screen and loading chute, and in others only a conveyor and loading chute are used to dewater these sizes. The results available show surface moisture in products of size range A varying from .3 to 3.0 percent.



Size Range B: (Intermediate Coal). Mean Size $\frac{1}{2}$ in. to $\frac{1}{4}$ in.

This range will include practically all commercial sizes which are smaller than Range A, and which are well screened over $\frac{1}{4}$ -in. or larger screens. They include sizes $\frac{1}{4}$ in. x $\frac{3}{4}$ in., $\frac{3}{8}$ in. x $\frac{3}{8}$ in., and larger sizes up to a mean of $1\frac{1}{4}$ in. Sizes in Range B are usually dewatered on sizing screens of the shaking or vibrating type, in addition to some dewatering in elevators, conveyors, or gravity screens. In some cases, high-velocity air currents are used to blow off some of the water. The surface moisture of 15 products reported in this range varies from 1.8 to 5.5 percent, with only two over 4.5 percent.

Size Range C: (Small Coal). Mean Size $\frac{3}{16}$ in. to $\frac{3}{8}$ in.

This size range includes sizes from which the fines have not been removed, except to a limited extent incidental to washing and separating from the bulk of the water. It includes sizes $0 \times \frac{3}{8}$ in. to $0 \times \frac{3}{4}$ in. round. These sizes are usually dewatered by screens, conveyors, etc. The screens used vary widely in pitch, in cycle, and in frequency of movement, and in size and shape of openings. Very little data are generally available as to the efficiency of the combinations of these variables. Products in Size Range C dewatered by screens and conveyors show surface moisture varying from about 9 to 19 percent.

Centrifugal Dryers

In some plants sizes C are further dewatered in centrifugal dryers. Four or five plants report units having capacities of 30 to 75 t.p.h., reducing average surface moisture to 4 to 7.5 percent. A great deal of valuable data on operating results and costs are given for the operation of centrifugal dryers in three large plants in an article, "Dewatering Coal," by Barley and Parmley, which was published in *Coal Age*, October and November, 1935. They show that in their experience the dryers materially reduce the ash and sulphur as well as the moisture, but that they cause breakage, which is a considerable item. They materially increase the percentage of minus 14-mesh material to be recovered and dewatered.

Size Range D: Fines Recovered from Water by Screens, Mean Sizes .023 in. to .185 in.

In some cases these sizes are removed from settling tanks by elevators or scraper conveyors. In others they are removed by pumps. From elevator or pump the material is usually passed over high-speed screens with suitable openings ranging upward from $1\frac{1}{5}$ mm.

In some cases the product is wasted, in others it is mixed with dry slack or with larger washed or unwashed sizes. In others it is loaded and shipped separately, but on a very limited market.

The surface moisture remaining in these products depends chiefly upon the size of the particles, the percentage of clayey material present, and the thoroughness of the dewatering. It varies from about 18 to 45 percent.

Size Range E: Fines Recovered from Water; Mean Sizes .008 in. to .023 in.

In many cases the sizes smaller than Range D are wasted without removal from the water, but where such material may not be discharged into streams, some plants recover this material by vacuum filters. These units receive the fine coal or underflow from settling tanks. The water is drawn through the filtering surface by a vacuum and discharged on one side, while the coal forms a cake on the opposite side, from which it is dislodged and carried away in a conveyor. Four plants recovering coal finer than 28-mesh in this manner report surface moisture in the filter cake ranging from 18 to 26 percent. In these

plants these products are mixed with other products in Size Range C and heat dried.

Heat Drying

Data were received from 14 plants which are heat drying some products. In some cases products in Size Range C are heat dried in rotary kiln-type dryers, and in other cases on conveyor-type dryers. These dryers bring the hot gases from a furnace into direct contact with the coal to be dried. Many of the furnaces are stoker fired and have automatic temperature regulating devices. The inlet temperatures of gases to the dryers range from about 900° to $1,400^{\circ}$ F., and the outlet gases from about 150° to 400° F. The temperature of coal discharged usually ranges between 120° and 165° F.

In one plant where all the coal is shipped as a 0×4 -in. product, it has been found more economical to obtain the desired moisture reduction by putting a part of the 0×4 -in. coal through the dryers, than if only the $0 \times \frac{1}{2}$ -in. sizes, for example, were dried. This plant reports an increase in capacity of 167 percent and an increase of water evaporated of 60 percent with the same equipment when drying 0×4 in. as compared with $0 \times \frac{3}{8}$ in. The average surface moistures as reported by these plants range from $1\frac{1}{2}$ to 5 percent in products $0 \times \frac{3}{4}$ in. or smaller.

A few plants are using warm air at temperatures from 100° to 300° F., as an aid in dewatering, but no definite figures are at hand on the results.

A number of plants are drying

TABLE I.—DEWATERING AND DRYING COMMERCIAL PRODUCTS

Size Range	Mean Diameter* of Product	Types of Equipment Used for Dewatering	Average Percent Surface Moisture in Product
PRODUCTS REASONABLY FREE OF MINUS ¼-IN. MATERIAL			
A	1½-in. to 4½-in.	Conveyor, Elevator, Gravity Screen, Shaking Screen, or Vibrating Screen ¹	.3 to 3.0
B	½-in. to 1½-in.	Conveyors, Elevators, Gravity Screens, Shaking Screens, Vibrating Screens ²	1.8 to 5.5
PRODUCTS INCLUDING 0 x ¼-IN. MATERIAL			
C	3/16-in. to ¾-in. ³ .1875 to .375	Elevators, Conveyors and Screens....	10 to 19
		Centrifugal Dryers	4 to 7½
		Evaporation, Heat Dryers ⁴	1½ to 5
FINES RECOVERED FROM WASH WATER			
D	.023-in. to .185-in.	High-Speed Screens ⁵	18 to 45
E	.008-in. to .023-in.	Vacuum Filters	18 to 22

¹ In many cases only one of these types is used, in others two or more. When screens are used, sizing is usually combined with dewatering.

² Generally two or more and sometimes all of these types are used in series for these sizes. Sizing is usually combined with dewatering.

³ Sizes between $0 \times \frac{3}{8}$ -in. and $0 \times \frac{3}{4}$ -in. round.

⁴ Heat dryers are sometimes used for larger sizes when they are to be shipped with fines.

⁵ Frequently with slight pitch or with upward slope.

* Half of the sum of the round hole equivalents of the screen openings is taken as the mean diameter of the product.



sizes from $\frac{1}{4}$ in. to $\frac{1}{2}$ in. x $1\frac{1}{4}$ in. to 2 in. by passing furnace gases at temperatures around 900° F. through the coal as it passes over flat shaking screens having stainless-steel plates perforated with $\frac{1}{8}$ -in. slots. These plants report surface moisture in the products reduced to around 2 to 2.5 percent.

Of course, it is possible to heat dry coal until practically all moisture has been eliminated, but at best it is a relatively expensive process which requires careful and expert control, and in each individual case there are a large number of factors which must be considered in determining the extent to which the drying is to be carried.

Moisture and Tonnage per Square Foot of De-Watering Screens

Table II lists 21 products of different sizes dewatered over screens having openings ranging from 60-mesh to 2-in. round. The percentage of open area, the tons per hour per square foot of open area, and the surface moisture are given for these products. The tons per square foot of screen, of course, may be obtained by multiplying the figures for open area by the percentage of open area given.

There are so many variables which affect the dewatering results which cannot be shown in such a tabulation that while some of the figures are significant, there are not enough data available on a given size or tons per unit ratio to make the comparisons conclusive as to what they seem to show. For example, items 8 and 9 are for the same coal. The No. 8 results show 6.5 percent moisture in the product shortly after it passed from under an overhanging screen dewatering a larger size. The No. 9 results averaging 3.5 percent are for the same product after it had passed over approximately 15 lin. ft. of additional surface. A similar case is shown by items 12 and 13, in which the former shows 8 percent after the coal had passed one short screen, and the latter 4.5 percent after it had passed an additional screen.

Some of the factors other than the size of the coal which materially affect the moisture in the coal as it passes a given area of dewatering surface are the percentage of water in the feed, the percentage and character of minus 48-mesh material present, the tendency of the openings to clog or bind, and the extent to which

TABLE II.—SURFACE MOISTURES AND TONS PER HOUR, PER SQUARE FOOT OF OPEN AREA OF THE DEWATERING SURFACE OF SCREENS
SIZES OF PRODUCTS AS SHOWN

Item No.	Size of Product Dewatered		Screen Openings in Dewatering Surfaces				Surface Moisture Product Percent
	Range	Mean	Actual	Eq. Rd.	Open Area	T.P.H. Sq. Ft. Open Area	
1	60M x 14M	.027	60M	....	32	.43	23.3
2	48M x 5/16	.156	$\frac{1}{4}$ mm.	....	10.8	8.89	10.2
3	48M x 5/16	.156	$\frac{1}{4}$ mm.	....	10.8	7.78	16.6
4	48M x $\frac{3}{8}$	.185	$\frac{1}{2}$ mm.	....	8.0	8.00	18.9
5	28M x 7/16	.23	$\frac{1}{2}$ mm.	....	15.0	1.50	11.5
6	$\frac{1}{4}$ x $1\frac{1}{4}$	.75	$\frac{1}{4}$ ww.	$\frac{1}{4}$	40.0	2.63	3.0
7	$\frac{3}{8}$ x $1\frac{1}{8}$	.75	$\frac{3}{8}$ Rd.	$\frac{3}{8}$	40	3.4	3.7
8	$\frac{1}{4}$ x $1\frac{1}{4}$	.75	$\frac{1}{4}$ x $\frac{1}{2}$	$\frac{3}{16}$	36.5	1.68	6.5
9	$\frac{1}{4}$ x $1\frac{1}{4}$	.75	$\frac{1}{4}$ x $\frac{1}{2}$	$\frac{3}{16}$	36.5	1.06	3.5
10	$\frac{3}{8}$ x $1\frac{1}{4}$	.81	$\frac{1}{2}$ x $2\frac{1}{2}$	$\frac{5}{16}$	59.0	2.40	4.2
11	$\frac{3}{8}$ x $1\frac{1}{4}$	.94	$\frac{1}{2}$ Sq.	$\frac{1}{2}$	57.0	1.6	3.2
12	$\frac{1}{4}$ x 2"	1.12	$\frac{1}{4}$ x $2\frac{1}{2}$	....	36.5	1.42	4.5
13	$\frac{1}{4}$ x 2"	1.12	$\frac{1}{4}$ x $2\frac{1}{2}$	....	55	4.3	8.0
14	$\frac{3}{8}$ x 2"	1.18	$\frac{3}{8}$ Rd.	$\frac{3}{8}$	40	1.93	3.6
15	$1\frac{1}{8}$ x 2"	1.56	$1\frac{1}{8}$ Rd.	$1\frac{1}{8}$	47	1.71	1.8
16	$1\frac{1}{4}$ x 2"	1.62	$1\frac{1}{4}$ Rd.	$1\frac{1}{4}$	63	.76	1.5
17	$1\frac{1}{4}$ x $2\frac{1}{2}$	1.87	$\frac{1}{2}$ Sq.	....	57.1	1.6	1.7
18	2 x 3	2.50	2" Rd.	2	58.0	.90	1.5
19	5/16 x $4\frac{1}{2}$	2.41	5/16 Rd.	5/16	40.8	3.82	1.0
20	5/16 x 4	2.16	5/16 Rd.	5/16	16	2.14	.3
21	2 x 4	3.00	2" Rd.	2"	51.0	1.53	1.1

Items 2 to 6, inclusive, dewatered on wedgewire screens.

water carries across, on and under the parts of the screen and supports. The $\frac{3}{8}$ -in. x 2-in. coal shown by item 14 with 3.6 percent moisture shows an average of 2.9 percent after passing an additional sizing and dewatering screen.

It is interesting to note the large tonnages per square foot of open area for the wedgewire surfaces shown in items 2 and 6. Recent experiments show interesting results with wide ranges of sizes dewatered together on wedgewire screens.

Summary

1. The data show the following reasons why reasonably accurate measurements of surface moisture in dewatered products are necessary:

(a) Comparison of dewatering data on products from different beds is impossible except on a surface moisture basis, because bituminous bed moistures vary from about 2 to 18 percent or more.

(b) In comparing or predicting results on products from a single bed, total moisture figures obscure the relationship of surface moisture to size and surface of product which is clearly shown by surface moisture data in Figure I.

(c) To facilitate development of effective and economical methods of operation and control of dewatering.

(d) To reduce errors in measurement, which now frequently make data of doubtful value.

2. Table I shows a tentative classification of size ranges dewatered with a range of surface moisture found after dewatering products in each size range with suitable types of equipment.

3. Table II shows 21 products of different sizes dewatered over screens having openings ranging from 60-mesh to 2-in. round. The percentage of open area, the tons per hour per square foot of open area, and the surface moisture are given for these products. Products in Size Ranges B and C show important additional reduction in moisture when passed over a second or third screen of the same or approximately the same type.

4. Eight plants heat drying products from 0 to $\frac{3}{16}$ in. by $\frac{3}{8}$ in. to $\frac{1}{4}$ in. use kiln or conveyor type dryers, and report surface moisture in products ranging from $1\frac{1}{2}$ to 5 percent. Others drying sized products over $\frac{1}{4}$ in. to $\frac{1}{2}$ in. and through $1\frac{1}{2}$ in. to 2 in. on shaking screens report surface moistures in the products from 2 to $2\frac{1}{2}$ percent.

Submitted by the Committee on Surface Preparation.

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Annual Review —1937

Sharp fluctuations due to general business conditions characterized mining during the past year — particularly in the case of metals.

Important strides continued to be made in technique of mineral development and extraction, all leading toward improved efficiency.

Quick-fire reviews of significant happenings in the various branches of the mining industry, prepared exclusively for the Mining Congress Journal by authorities in their respective fields, are presented in the following pages.



Soledad Mountain from the north, Mojave district, California. 1, Mojave Mining & Milling Co.'s workings; 2, Karma Mill and main haulage adit; 3, Karma open-cut; 4, Queen Esther mill and tailings; 5, Queen Esther mine, caved stopes; 6, Mojave Bonanza workings; 7, Golden Queen office; 8, Waste glory hole, Golden Queen; 9, Discovery shaft, Silver Queen claim (later Golden Queen mine); 10, adit, 200-foot level, Golden Queen; 11, Adit, 400-foot level, Golden Queen; 12, Golden Queen mill; 13, Main haulage adit, 600-foot level, Golden Queen; 14, Tailings pond, Golden Queen

METAL MINING TECHNOLOGY[†]

• *Underground Mechanization, Open Pit Mining, Shaft Sinking, and Air Conditioning Show Important Developments*

THE metal-mining industry entered 1937 on a rising tide of production, employment, and wage rates, prepared to operate at high efficiency by adjustments and technologic improvements born of the vicissitudes of the lean years immediately preceding. By May, wages, which in the copper, lead and zinc industries are adjusted up or down as metal prices rise or fall, were generally higher than in the war period, though metal prices were lower than at that time. There was a scarcity of

By CHAS. F. JACKSON

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skilled miners in some districts despite increased mechanization, a circumstance providing food for thought to those interested in the effect of mechanization upon employment trends.

In this connection, it is of interest to note the effect produced by changes in equipment and practices introduced during the past 25 years in the Lake Superior iron ore region. Although the production per man is now two or



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MINING CONGRESS JOURNAL

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three times that in 1912, the total cost of producing a ton of iron ore today is practically the same as then. For one thing, a larger percentage of skilled labor is employed now; but in addition, it may be noted that the lowest-paid labor in open-pit mining now receives a minimum of \$5 per eight-hour day with time and one-half for overtime and for time in excess of 40 hours per week, whereas the former rate was \$2.10 for a 10-hour day. Other classifications of labor have been advanced proportionately.

In the first half of the year higher prices and expanding demand for metals encouraged the launching of a number of important new enterprises, together with additions and improvement to existing plants involving important capital expenditures. Among these is cited the announcement of a program by the Phelps Dodge Corporation for opening the Clay orebody at Morenci, Ariz., and equipping it for open-pit mining, a project requiring over a period of years a reported capital outlay of over \$28,000,000. Other capital expenditures planned by this company are expected to total about \$12,000,000 over a five-year period. Large expenditures were undertaken for development and equipment of a copper property in the State of Washington by the Howe Sound Company. A number of long tunnel projects were started in 1937, notably the 7,000-foot vehicular tunnel at Bingham designed to release for mining a large tonnage of ore that is now tied up by a surface road, and the 22,000-foot Elton tunnel being driven from the west in Tooele Valley to facilitate drainage, development and transportation of ore from the Utah-Apex and Utah-Delaware mines at Bingham, Utah. Important stripping operations were undertaken in 1937 on the Mesabi iron range to uncover additional ore, and a large contract was reported to have been let for stripping overburden from the Yellow Aster mine at Randsburg, Calif. In addition, unwatering projects, some of which are large undertakings, were started preparatory to resumption of activity at old mines.

Projects of the type mentioned are of interest from the technologic viewpoint, since most of them are employing modern equipment and practices and in carrying them out it may be anticipated that new improvements in technique will be developed.

As the year ends, operations are being curtailed or suspended in many areas, and the tide is flowing in the



South Pit, Carson Hill Gold Mining Corporation, Calaveras County, California

opposite direction to that at the beginning of the year.

Prospecting and Exploration

Of considerable significance is the growing number of exploration programs based upon broad geological principles—structural and genetic relationships, zonal arrangements, and the like—in and around former productive areas, but where direct surface indications of ore are lacking. In this work increased use of diamond drilling is noted, and there appears to be a growing realization of its value for delineating buried structure as a guide to the search for ore. One may perhaps visualize “wild-catting” for ores under technical guidance, much as oil wells are now drilled in new territory

on the strength of geological and geophysical evidence. It appears certain that in the not far-distant future this country must rely upon such methods for the discovery of new deposits as those now known or apexing near surface become depleted.

The use of Diesel-powered bulldozers for deep surface trenching, supplemented by churn-drilling for depth exploration, has been reported from Montana.

Placer Mining

Placer mining for platinum-group metals began near Goodnews Bay, Alaska, with the operation of a drag-line during the summer and installation of an eight-foot bucket dredge which started operation early in November. Some new gold dredges



Placer operation near Camanche, California. Drag line excavator with floating washing plant



Calaveras Central drift mine—a large producer in the Mother Lode district in Calaveras County, California

started operation or were planned, and a considerable number of dragline and power shovel or drag-scraper operations of the type developed during the last few years, were started. These comprise the use of excavators on land and washing plants either on barges floated in a small pond, movable on land, or stationary and employing trucks for hauling the gravel from the pit to the plant.

Jigs appear to be finding increased favor in the gold recovery equipment of standard dredges.

Lode-Gold Mining

A large number of small gold mines continued production, some new ones were opened, and operations were resumed at others long idle, contributing in the aggregate a substantial output of gold during the year. During the past two years the writer has visited a considerable number of such properties and some larger operations that had entered or were preparing to enter production in virgin territory. At perhaps 75 percent of the properties visited, heads were reported to average 0.21 to 0.23 ounce gold, which indicates a recovery of around \$4 to \$4.25 per ton at the \$20.67 price. This would be about the cut-off for ore grade, and therefore was left in the mine by former operators. Raised to a recovery value of around \$7 per ton by the new gold price, considerable tonnages of former sub-ore grade have now become profitable to work and are thus contributing to current output.

Mechanization Underground

If one may judge by "sampling" the practices in a number of mining districts visited by the writer, it is safe to say that mechanical underground loading in metal mines became more general in 1937. Certainly some changes occurred where mechanical loading was already in vogue. In the Lake Superior district, where only a few years ago scraper hoists of 15-h.p. capacity were replacing those of 5, 7½, or 10-h.p., many mines are now discarding the 15-h.p. units and are purchasing nothing smaller than 25-h.p. hoists. Rope speeds and the size of scrapers have been considerably increased also.

Slushing or scraping is reported to be supplanting gravity for moving broken ore from the stope bottoms to the cars¹ at Climax, Colo. The superiority of slusher over chute-loading for sticky iron ore was demonstrated prior to 1929 at the Montreal mine in Wisconsin, where cars were loaded by scrapers from a scraper drift at the main level into which the ore fell through open-bottom raises. A similar method has been employed for some years by the Hudson Bay Mining and Smelting Co., in Manitoba, but this is probably the first large-scale application in the western United States. At Climax, 150-h.p. hoists wound with 1½-in. cables pull 72-in. hoe-type scrapers, dragging ore

through a slusher drift into a hopper, through which it runs into the mine car directly below. A total cost saving of \$0.0709 per ton of ore over chute loading is said to have resulted.

Scraping is reported to be supplementing St. Joe shovels for loading ore in the southeast Missouri lead district and is now being adopted in some mines in the Tri-State district. Although the latter was one of the first districts in this country to employ scrapers, with installations dating back to about 1915, they found little favor there until recently.

The use of light, dipper-type loaders in driving small headings continued to increase, particularly in western mines, and larger shovels or scrapers were employed for fast tunnel driving on the larger projects under way in 1937.

Mining Methods

Interesting changes were noted in the sublevel caving practice at the Montreal mine in Wisconsin. In sublevel caving, the subs are now at 50-ft. vertical intervals, and two adjoining slice drifts and the hogback are caved back simultaneously, whereas previously the interval was 17 to 25 ft. and only one slice was caved back at a time.² The ore from slices in a block 300 ft. long is scraped to a common subdrift on the same level through which it is scraped to an open bottom raise at one end or the other of the block. From the bottom of the raise another scraper drags the ore into the cars on the haulageway. Earlier practice was to drag the ore from each slice into a separate raise and load from a long scraper drift connecting the bottoms of the raises. The latest practice therefore eliminates a large number of long raises.

An adaptation of sublevel caving was noted by the writer at Consolidated Copper Mines, in Nevada, where hogbacks beneath mined-out caving blocks are being extracted by caving back on the retreat the sides and backs of drifts driven under the hogbacks, in virtually the same manner employed in sublevel caving on the Gogebic range in Michigan. Scrapers are used to drag the caved ore directly into cars on the haulageway.

Top-slicing adapted from Mesabi range practice is being introduced on the Comstock lode in Nevada for mining old pillars and heavy ground disturbed by earlier mining operations.

¹ Romig, W. E., "Slushing vs. Gravity Loading at Climax," Mining Cong. Jour., Nov. 1937, pp. 28-34.

² Schaus, O. M., "Mining Methods and Costs at the Montreal Mine, Montreal, Wisconsin," Inf. Circ. 6369, Bureau of Mines, 1930, p. 16.

In open-pit mining, a noteworthy development is the increased use of trucks and the introduction of large belt conveyors on the Mesabi range to replace locomotive haulage out of the pits. At the Spruce mine, Eveleth, Minn., a belt-conveyor system 4,481 ft. long, 3,174 ft. of which is underground below the bottom of the pit, started operation last August and is being employed to convey 5,000 tons of ore per hour to a shipping pocket on surface. Ore is fed to the belt from three raises into which open-pit ore is dragged by tower excavators equipped with 3-cu. yd. scrapers or by 20-ton, rear-dumping trucks loaded by electric shovels. A jaw crusher at the top of each raise reduces the ore to 3 in. before it drops to the feeder at the bottom. A number of similar installations are planned and it is predicted that a combination of trucks, draglines and conveyor belts will soon supersede locomotive haulage in many open-pit operations in the Lake Superior region. At least one mine was employing a conveyor belt underground to convey ore from top-slice raises through the haulageway and thence to the surface plant.

Shaft Sinking

Preparations were reported late in the year for sinking a 66-in. circular ventilating shaft, 1,200 ft. in greenstone by the shot-drill method mentioned in this column a year ago and described in detail elsewhere.³ Late in the year a 4-ft. diameter hole was started with a calyx drill at an Arizona mine. It was being drilled in the bottom of a shaft to provide a cheap method of mucking while deepening the shaft 200 ft. to a station already cut below. In this operation, however, Ingersoll-Rand equipment is employed, and the cutting shoe is rotated from the top of the hole by a string of heavy drill rods instead of by close connection to driving mechanism installed in a cab let down into the hole.

Air-Conditioning

Continued successful operation of the air-conditioning plant at Butte, Mont., is reported. During the year two Carrier centrifugal refrigeration units were installed on the 3,600-ft. level of the Magma mine in Arizona.

³ Newsom, J. B., and Jackson, C. F., "Shaft Sinking with a Shot Drill, Idaho Maryland Mine, Grass Valley, Calif.," Inf. Circ. 6923, Bureau of Mines, 1936, 10 pp.

Newsom, J. B., "Shaft Boring Found Inexpensive and Safe," Eng. & Min. Jour., Sept. 1936, pp. 443-446.

Newsom, J. B., "Boring a Five-Foot Shaft 1,125 ft. Deep at the Idaho-Maryland Mine," Mining and Metallurgy, Sept. 1936, pp. 421-423.

After the first unit had been in operation for two weeks blowing air along the drift for 2,000 ft. to an upcast raise, the temperature had been reduced at this point from 95 degrees wet—106 degrees dry to 86 degrees wet—89 degrees dry. It is anticipated that the installation will permit the start of stoping within six months rather than two years, as formerly.

Realizing that the dust hazard in mines presents an operating problem requiring primarily the elimination of dust at every stage of mining, the larger operators continued their efforts

along this line with unabated energy. Dust surveys were made in many mines, and research was conducted involving the testing of special types of drills and wetting agents, water sprays in connection with blasting, and use of dust-settling agents along haulageways. Improved ventilation provided in many mines has done much to improve dust conditions. The use of respirators, many improved types of which are now available, has undoubtedly contributed materially toward protection against the dust hazard.

IRON ORE†

• Production Fourth Highest on Record; Consumption Curbed by Recession

By HUBERT W. DAVIS

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EXPECTATIONS of increased activity in iron ore in 1937 were fully realized, as production and shipments in the United States were, respectively, the fourth and fifth highest on record. However, due to the precipitous decline in operations at blast furnaces during the last quarter of the year, consumption of iron ore made a relatively smaller gain; in consequence, stocks at furnaces and lower lake ports were unusually high at the close of 1937.

Production of iron ore in the United States in 1937 (exclusive of ore containing 5 percent or more manganese) was 72,166,000 gross tons, an increase of 48 percent over 1936 and only 4 percent less than the record established in 1917. Shipments of iron ore were 72,339,000 gross tons in 1937, an advance of 41 percent over 1936 but 7 percent smaller than the record year (1916). Consumption of ore in blast furnaces was about 62,000,000 tons in 1937, a gain of about 20 percent over 1936.

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H. W. DAVIS

The near-record production of iron ore in 1937 reflects, of course, chiefly the greatly accelerated activity at steel plants, as open-hearth and Bessemer furnaces operated at 85 and 65 percent, respectively, of capacity during the first nine months. A contributing factor, too, was the relatively high price of steel scrap, which resulted in the use of a considerably higher ratio of pig iron to scrap in open-hearth furnaces than in previous years when prices of steel scrap were substantially lower. Further, the domestic iron ore industry was aided by an unprece-



Giles brown iron ore mine, Central Iron & Coal Co., Tuscaloosa County, Alabama. Steam shovels loading ore below and stripping overburden above

dented demand from abroad for pig iron. Indeed, exports of pig iron (719,666 tons) during the 10 months January to October exceeded the previous record of 656,220 tons made during the entire year 1917. Exports of iron ore to Canada (1,227,220 tons) during the first 10 months of 1937 were also much larger than in the entire year 1936 (636,524 tons). On the other hand, imports of iron ore into the United States were proportionately less than in 1936, because of improved demand and higher prices abroad.

High Scrap Prices

The improved operating rate at open-hearth steel plants, which began in the last quarter of 1936 and reached 92 percent of capacity in April, was accompanied by a sharp advance in the price of heavy melting steel scrap, the average composite price reaching about \$22 a ton in late March. Meanwhile, the number of active blast-furnace stacks making pig iron increased from 164 in January to 182 in April. Because of labor troubles in June the operating rate at open-hearth steel plants dropped about 15 points, and about 17 blast-furnace stacks were banked. Concurrently, the average composite price of steel scrap declined to about \$17 a ton. Following settlement of labor disputes, the operating rate at steel plants and blast furnaces increased substantially during July and August, and the average composite price of steel scrap advanced to \$20.50 a ton. Consequently, consumption of iron ore in blast furnaces during the first 10 months of 1937 was about 56,283,000

tons, of which 49,345,000 tons was from the Lake Superior district.

Lake Superior District

Thus, the mines in the Lake Superior district, which supply about 85 percent of the total United States production, were confronted with no small task in 1937. Furthermore, on May 1, 1937, stocks at lower lake ports (2,336,653 tons) were the lowest since 1907 and stocks at furnaces using lake ore had dwindled to 12,295,385 tons. Therefore, it was necessary not only to replenish the depleted stocks resulting from accelerated smelting operations subsequent to the close of the shipping season in 1936, but to move sufficient ore for current requirements and to accumulate a reserve at lower lake ports and furnaces. Accordingly, production schedules were stepped up, many inactive mines were reopened, and all ore-

carrying vessels were pressed into service, with the result that a heavy ore movement got under way as soon as navigation opened.

Details of the Lake Superior iron mining industry are given in the following paper by Mr. Harbaugh.

Other Districts

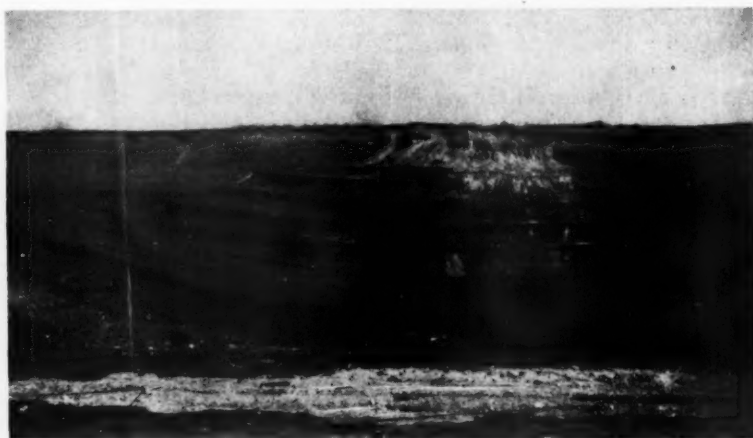
In other districts, such as the Birmingham, Cornwall, northern New Jersey, and Adirondack, iron-ore mining was also stimulated in 1937, and many inactive mines were reopened. These districts are relatively small producers and the mines are largely underground, so that their output is not susceptible to such great flexibility as in Minnesota, where mines are mainly open-pit.

Production of iron ore in Alabama was about 6,360,000 tons in 1937, an increase of 52 percent over 1936.

Production of iron ore in New Jersey, totaling 525,000 tons in 1937, was 228 percent larger than in 1936 and the greatest since 1909.

The combined output of iron ore in New York and Pennsylvania was about 2,625,000 tons in 1937, an increase of 37 percent over 1936. Of considerable significance to the ore industry was the acquisition late in 1937 of the mines of Witherbee Sherman Corporation by Republic Steel Corporation and the shipment of a 3,000-ton cargo of ore to Cleveland, Ohio. The ore was shipped from Port Henry (N. Y.) through the New York ship canal to Oswego (N. Y.), where it was transferred to a lake ore vessel.

The combined production of iron ore in Wyoming and Utah, where there are also important mining units, was 894,000 tons in 1937, a gain of 35 percent over 1936.



Part of the huge Leonidas pit at Eveleth, Minnesota

The Lake Superior Iron Mining Industry

• New Record Established by Shipments From Minnesota Ranges, With Menominee Declining

By M. D. HARBAUGH

Vice President
Lake Superior Iron Ore Association

THE 1937 lake shipping season for iron ore from Lake Superior mines closed with the departure of the last cargo from Escanaba, Mich., November 28, completing a movement of 62,598,836 gross tons from the docks for the five upper lake ports. In addition, the all-rail movement from mines of this region to consuming points, estimated at 600,000 tons (based on 10 months' actual figures), brings the total shipments to nearly 63,200,000 tons for the year. This total has been exceeded only three times—in 1929, 1917, and 1916—and the boat movement only twice—in 1929 and 1916. Shipments from the several lake ports by ranges are indicated as follows:

MINNESOTA RANGES		
	Gross tons	Pct. of total
Vermilion	1,412,448	2.25
Mesaba	45,458,891	72.82
Cuyuna	1,825,941	2.92
Total Minnesota	48,697,280	77.79
MICHIGAN-WISCONSIN RANGES		
	Gross tons	Pct. of total
Marquette	5,477,512	8.75
Gogebie	5,651,879	9.03
Menominee	2,772,165	4.43
Total Mich.-Wis.	13,901,556	22.21
Total	62,598,836	100.00

The lake movement from Minnesota Ranges exceeds the previous record of 1929, when 46,779,040 tons were shipped.

Active Early Season

The early opening of navigation, April 10, together with a most encouraging business outlook, swept the iron mining industry into its shipping season with great activity. Nearly 4,000,000 tons were shipped in April, and over 10,000,000 in each of the



M. D. HARBAUGH

following four months. The severe business "recession," which began to be felt in the latter part of September, checked the movement rapidly thereafter and prevented shattering the 1929 lake record of 65,204,600 tons, a possibility which had been anticipated earlier.

Ore Passing Soo a Record

Despite this, the amount which passed Sault Ste. Marie—59,450,859 gross tons—did break the previous record of 1929—58,856,027 gross tons. This greater tonnage from Lake Superior ports is due to the declining proportion of shipments from Escanaba, on Lake Michigan, which handles mainly the product of the Menominee Range. This decline is occasioned by lessened demand for high-phosphorous ores from this range.

The number of mines on all ranges which shipped in 1937 was 149, as against 131 in the previous year. Employment was maintained at the highest level since 1929, and wages were higher than ever before.

With the rapid decline in blast-furnace operations from 156 in blast at the end of August to 90 at the end of November, stocks of ore at furnaces and lower lake ports accumulated, so that on December 1 these totaled 42,625,954 tons, which is the largest amount on hand as of that date since 1926. The corresponding stocks on December 1, 1936, were 35,378,068 tons.

Truck and Conveyor Haulage

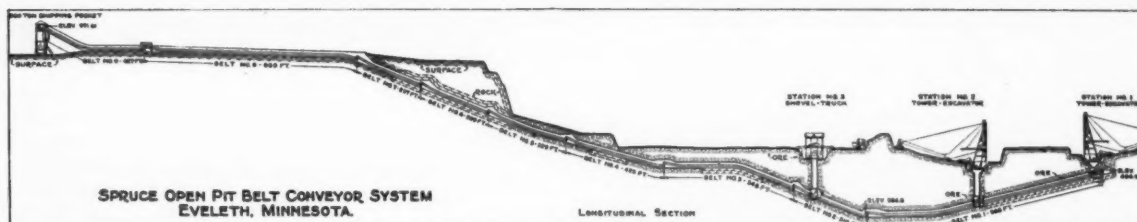
Important developments in open-pit iron mining during the year have been the rapid expansion of truck and conveyor haulage systems, which, combined with loading by small tractor shovels and by scrapers, bid fair to revolutionize the methods of handling ore from all but possibly the largest pits. Even in the latter, trucks and small shovels are likely to play an expanding role in the loading of cars in the pits. The substitution of such equipment, which is more flexible and generally less expensive than the heavy railway equipment long used in these operations, may be expected to have an important bearing upon the economics and hence upon the future of this industry.

The largest conveyor system for moving ore is that placed in operation during the year at the Spruce pit of the Oliver Iron Mining Company, at Eveleth. It is nearly a mile long, extending under the ore body and out onto the surface to a railroad shipping pocket, carrying a stream of ore at the rate of 500 ft. per minute and 750 gross tons per hour. The belt is loaded through raises or mill-holes which extend to the floor of the mine and into which ore is dumped by large trucks and is screened and crushed before being fed onto the belt.

The great facility and speed with which ore bodies—especially small ones—may be stripped and mined with handy small shovels and trucks, and with which clean-ups may be carried on around the larger pits, is of increasing significance to all operators of open-pit mines.

Beneficiation Progresses

The tonnage of beneficiated ore increases annually, and this year has witnessed important new experimental work in gravity separation. These efforts ultimately to make available to the blast furnace the enormous quantities of low-grade iron ores which



—Skillings' Mining Review.

exist in the Lake Superior region constitute pioneering of the utmost importance to the iron and steel industry, and to the nation as well.

With the higher labor and material costs which became effective during the year came added tax burdens, also. Hence, the operators have been forced to give increasing attention to every possible means of improving efficiency and lowering unit costs of production. At the same time, they have continued to give special attention to the health and welfare of their employees.

Working Conditions Improved

In line with the rapid conquest during recent years, of accident hazards and menaces to health which once were thought inherent in all mining operations, the industry has steadily improved working conditions in the mines. Through the combination of engineering and medical control, any dust hazard in these mines is essentially a thing of the past, so that nowadays men working underground are

likely to breathe purer and cleaner air than they get most other places.

The outlook for 1938 is essentially that of the present uncertain general business outlook. Certainly, the next shipping season will not open with such a rush as did the last. What the last half of the year may bring forth depends on too many variables to evaluate at present, but even so, the mine output in 1938 probably will furnish a basis for pleasing comparison with that of several recent lean depression years.

COPPER†

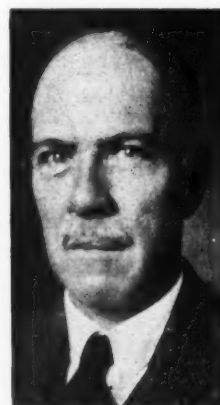
• Year Marked by Severe Fluctuation in Price and Output

THE year 1937 witnessed the collapse of another of the periodic gyrations of the copper industry. At the beginning of the year the domestic price of copper stood at 12 cents. Influenced by the same factors that had contributed to the abrupt rise in the closing months of 1936, it skyrocketed to a peak of 17 cents at the end of March. Within 30 days, however, it receded to 14 cents, at which level it remained until late in September. Further weakness developed, and at

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By J. W. FURNESS

Chief
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the close of the year the price stood at 10½ cents. Production and consumption in 1937 were considerably above the levels established in 1936. Stocks declined during the first four months of the year, but increased steadily thereafter, inventories at the close of the year being materially above those at the beginning.

In order to appraise properly the

developments in copper during 1937, it is necessary to review briefly the history of the past few years.

On December 31, 1935, according to the Copper Institute, world stocks of refined copper, exclusive of consumers' stocks, were estimated as 485,328 tons, of which the United States held 231,415 tons. In the early

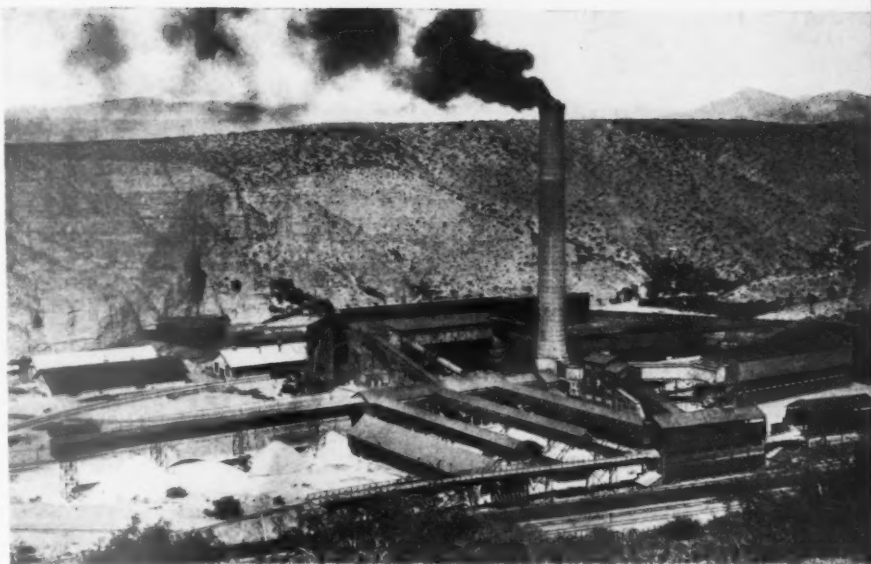
part of 1936 production was on a curtailed basis, but under the stimulus of record-breaking sales and rapidly increasing prices the production rate at principal properties in the United States and abroad was raised late in the year to near capacity operations.

Just how the copper would be absorbed, when capacity mine production reached the market in the form of refined copper, was a moot question to those viewing the market from the outside, and perhaps to the producers themselves. Much was said of the increased consumption of copper in building trades, the automobile industry and others, all of which was probably true, but it was not evident that the amount of copper used by these industries at full capacity could absorb the increased tonnages from domestic mines.

The apparent world consumption of copper was increased considerably by the building up of national defenses in the United Kingdom, France, and Germany, and by the supplying of Spain and later Japan and China with war material. Armament uses, however, could not be expected to continue to consume record tonnages.

For many years the United States consumed more copper than Continental Europe, but this condition was reversed in 1931. The peak of consumption in the United States was in 1929, whereas Europe attained it in 1937. The increased demand abroad did not greatly benefit the domestic industry, except through foreign subsidiaries, although in the past domestic mines were able to export the excess of production over domestic demand. The new condition was due partly to the high prices for copper during 1928-30 which stimulated production throughout the world, especially in Canada and South Africa. In 1930 the British Empire became self-sufficient as to its copper requirements, and for the first time since 1880 had an exportable surplus. The increased tonnages of copper made available filled needs formerly supplied by exports from the United States. During 1935-37 Germany attempted to curtail strictly domestic consumption in every way and to decrease the amounts of metal imported. The copper that was imported, preponderantly from the United States in earlier years, came mainly from Africa.

The changes in importance of leading producers of copper in the world are shown in the following table:



Clifton smelter of the Phelps Dodge Corporation, Clifton, Arizona

	Percent of world total	
	1929	1935
United States	48	23
Chile	16	17
Rhodesia	0.3	10
Canada	4	11
Belgian Congo	7	7

On December 31, 1936, world stocks of refined copper were 353,323 tons, of which the United States held 161,068 tons. The reduction of stocks in 1936 was made possible in part by the unprecedented sales over short periods during the year. For example, during two weeks in July and October, 134,574 and 141,385 tons, respectively, were sold. These sales totaled 275,959 tons, or approximately 40 percent of apparent consumption in that year, at prices ranging from 9½ to 10 cents a pound. They were made to large fabricating concerns, no doubt in anticipation of just such conditions as existed at the opening of 1937. A large part of the reduction in producers' stocks in 1936 may have been merely shifted to consumers' stocks.

In the United States the rapid rise in price in the last quarter of 1936 and first quarter of 1937 led to the opening of domestic mines that were closed when prices were low; to full production by low-cost producers; an increase in visible supply beginning in May; a falling off in demand, aggravated by the recession in domestic recovery from the depression period; and the old story that curtailment in production had not been inaugurated

soon enough or to a sufficiently drastic degree to meet the decreasing demand.

The writer submits that more stability in the copper industry and relief from the cycles of feast and famine, with which it is associated, might be attained by greater publicity regarding statistical data. Presumably this would assist in the maintenance of a price high enough to satisfy world demand but low enough to discourage uneconomic production. Knowledge concerning consumers' stocks, for example, would undoubtedly have discouraged somewhat the speculative enthusiasm that contributed to the sharp price advances of a year ago and now, when consumers' stocks are being drawn upon, would probably make a more encouraging record than does a statement of producers' stocks alone.

The wide variations in price and the changes in production incident thereto have forced certain mines to adopt selective mining of reserves, a practice not in accord with conservation principles. These factors have tended also to make employment in copper mining somewhat less certain than in some other branches of the mining industry. It is to be hoped that remedies for these perplexing problems may be speedily worked out and inaugurated by the industry, in order that the wide fluctuations to which it is subject may be reduced, employment conditions improved, and the likelihood of consumers turning to substitute materials lessened.

LEAD and ZINC†

• Both Metals Score Important Gains During Period of Violent Fluctuations

LEAD

THE statistical record of the lead industry of the United States for 1937 indicates major improvement over 1936. Production of refined lead from domestic ores increased 12 percent, from 387,698 short tons to 435,500 tons; apparent consumption of primary lead, not considering changes in producers' and consumers' stocks, rose 16 percent; the average price at New York was advanced from 4.71 cents per pound to 6.01 cents; and stocks of refined and antimonial lead declined from about 172,000 tons at the beginning of the year to less than 114,000 tons at the end. Most of the gains for 1937, however, were made during the early part of the year and much of the advance made in this period was wiped out by the sharp recession in the closing months.

As the year opened the lead market was in the midst of a speculative boom prompted largely by events in Europe. Following the hectic rise on the London Metal Exchange, the New York price skyrocketed from 6.03 cents on January 1 to 7.80 cents early in March. So active was the demand for metal abroad that at times the London price actually exceeded the domestic quotation, a situation not experienced since the World War. Withdrawal of speculative support, however, was instrumental in bringing the quotation down to 6.00 cents in April, at which level it remained for several months. Brisk sales in July and August stimulated a short spurt upward, but as the seriousness of the recession in general industrial activity became evident in the last quarter, demand fell, stocks increased, and prices again dropped, reaching 4.75 cents as the year closed.

Consumption of lead in 1937 progressed in all of the major uses except foil, where higher prices appear to have encouraged substitutes, particularly aluminum. Shipments of refined lead (including antimonial lead) to Ameri-

By ELMER W. PEHRSON

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Metal Economics Division
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can consumers probably exceeded 570,000 tons, compared with 513,000 tons in 1936. Of particular interest is the large increase in sales to cable manufacturers. Prior to the depression this industry used approximately 200,000 tons of lead annually, but recovery in this outlet has been exceptionally slow, the tonnage having increased only from 31,400 in 1933 to 61,400 in 1936, presumably as a result of fear as to future Government policy toward public utilities. The rapprochement under way at the close of the year, together with the improvement in 1937, suggests interesting possibilities for 1938 in this important use of lead, providing industry recovers from present levels.

Domestic mine production in 1937 approximated 460,000 tons, 25 percent above that of the previous year. All states, except Montana and Nevada, showed improvement, southeast Missouri making a 40 percent increase, Idaho 13 percent, Utah 26 percent, and the Tri-State region 25 percent. Uncertainty as to the 1938 price of silver led some operators to maintain production schedules during the closing quarter of the year, when the course of the market clearly indicated that curtailment was in order.

World production totaled approximately 1,900,000 short tons in 1937, 15 percent above that of the previous year and only 4 percent below the peak of 1,971,000 tons recorded in 1929. Production outside the United States reached a new high, Canada, Mexico, Australia, Germany, and British India, all major producing countries, contributing large increases. Consumption abroad likewise was at record levels but increased only 6 percent over 1936, as compared with 17 percent in the United States. Ger-



ELMER W. PEHRSON

many, Italy, and Japan, as well as France, were larger consumers in 1937 but consumption in the United Kingdom fell about 5 percent from the unprecedented total of 1936.

ZINC

Production, consumption, and prices of zinc were decidedly better than in 1936, but as was true for lead, the year was characterized by violent fluctuations, with most of the gains recorded in the early months of the year offset by rapid declines in the closing quarter.

Of outstanding interest was the acute shortage of metal for prompt delivery and the consequent importation of the largest tonnage of foreign metal ever recorded. This development led to the suggestion that the domestic industry no longer could maintain the position of self-sufficiency in zinc that this country has enjoyed for so many years. Careful investigation, however, indicates that the tightness of supplies was due to the peculiar coincidence of various factors and that there is no immediate danger of a permanent shortage of domestic metal.

The principal factor contributing to the tight position was the lack of power in Montana, resulting from unusual drought conditions and the abnormal demand for power by Government reclamation projects in the Pacific Northwest. This precluded full use of effective reduction capacity in that state. Smelting capacity was curtailed further by labor troubles, which caused one large smelter in Illinois to remain idle for several months. The situation was also aggravated by the change in consumers'

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buying practices. During the depression, with ample supplies always available, many concerns had pursued a hand-to-mouth policy, but with rising prices and rapidly declining stocks in 1937, they suddenly began covering for several months' operation. The effect of this was to pyramid the legitimate demand for metal to unreasonable tonnages. In August unfilled orders exceeded 100,000 tons, and by the end of the month producers' stocks had fallen to the extremely low level of 11,000 tons. However, supplies were soon augmented by large-scale purchases of foreign metal, imports of which reached a peak of 14,000 tons in September with a total in excess of 38,000 tons indicated for the year. Meanwhile production in Montana was increased, and as demand fell off with the recession in business in the last quarter, stocks mounted rapidly to 65,000 tons at the close of the year.

Smelter production of primary zinc from domestic ores in 1937, as reported by the Bureau of Mines, amounted to 550,200 short tons, an increase of 12 percent over 1936. Zinc produced from foreign ores totaled 6,500 tons, as compared with 329 tons in the previous year. The output of redistilled secondary metal likewise increased, from 42,209 to 50,900 tons, so that the total production of distilled and electrolytic zinc in 1937 was about 607,600 tons, compared with 534,341 tons in 1936. Montana and Illinois produced less zinc in 1937 than in 1936, but Oklahoma and Pennsylvania showed large increases, the latter establishing a new peak.

Apparent consumption of new metal was about 11 percent higher, but undoubtedly a substantial part of the increase was absorbed in consumers' stocks. Consumption was well maintained in all of the major uses except zinc oxide and lithophone, which registered small declines.

Prices followed an uneven course throughout the year, rising from 5.45 cents (St. Louis) on the 1st of January to a peak of 7.50 cents early in March, largely on the strength of the foreign market. The subsequent break in London caused domestic quotations to settle to 6.75 cents in May and June, only to rise again to 7.25 cents early in August as large domestic sales rapidly depleted available stocks. From the latter part of September to the end of the year the trend was downward, and on December 31 the quotation stood at 5.00 cents. The yearly average was 6.50 cents, compared with 4.90 cents in

1936. For several months in the last half of the year the differential between London and New York prices favored importation of metal.

Mine production totaled approximately 618,000 tons, 7 percent above 1936. Declines were noted in Kansas, Montana, Nevada, Wisconsin, and Washington, but other states either maintained production or made substantial increases. The Tri-State district, with an increase of 3 percent, contributed 38 percent of the 1937 total. Supplies of ore at all times were adequate to meet the demands of the smelters.

World production in 1937 reached a new high of approximately 1,840,-

000 short tons, production abroad having increased about 11 percent as compared with 12 percent in the United States. There was little change in the smelter output of Australia and the United Kingdom, but Canada, Belgium and the Netherlands, Germany, France, and Italy scored substantial increases.

World consumption likewise was at record levels, increasing 7 percent outside the United States, compared with 11 percent at home. Accumulation of war stocks of metal, particularly in Europe and Japan, undoubtedly has contributed largely to the consumption records established during the past two years.

GOLD and SILVER†

By CHAS. W. HENDERSON

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GOLD

MINE production of gold in the United States (territories included) amounted to 4,752,801 ounces in 1937, which represented an increase of 369,997 ounces, or 8 percent, over the 1936 production of 4,382,804 ounces. Considering all other factors of gold production, it is apparent that the potency of the 69 percent increase of the value of gold from \$20.67 to \$35 an ounce is still with us but the power of that increase in price to cause continued increases in production is on the wane. The increase in production for the year 1937 over the year 1933 was 81 percent. The increase in 1934 over 1933 was 21 percent; in 1935 over 1934, 18 percent; in 1936 over 1935, 18 percent.

Price Changes Reviewed

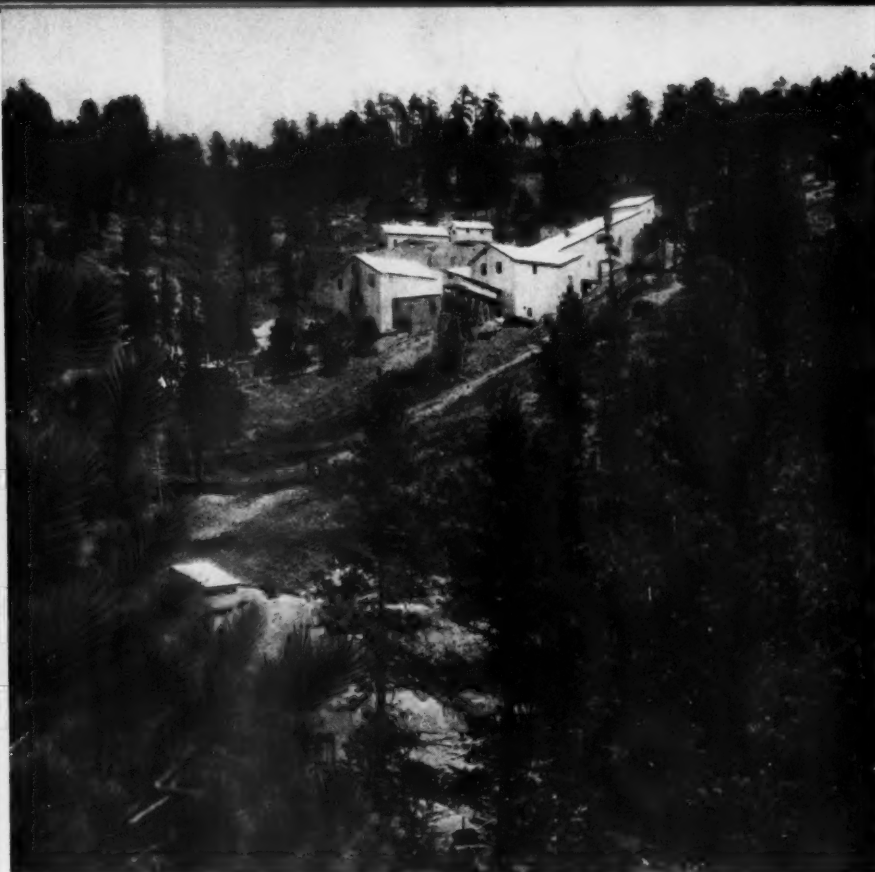
The change in price for gold during 1933 is now broadly known the details of the change are not so well

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CHAS. W. HENDERSON

known. Great Britain followed by many other countries, was off the gold standard in September 1931. Not until April 19, 1933, closely following the bank holiday, March 6-13, did the United States go off the gold standard. After April 19 there would have been profit for United States gold producers to sell gold abroad, but President Roosevelt's executive orders of April 5 forbade the hoarding of gold coin, gold bullion, and gold certificates. This was followed by the Presidential Executive order of April



New 125-ton cyanide mill of Gilt Edge Mines, Inc., near Lead, South Dakota

20, 1933, relating to foreign exchange and earmarking, and export of gold coin, bullion, or currency, that forbade the export of gold bullion.

Premiums on newly mined gold in the United States in 1933.—The newspapers on July 27 announced a decision of the Attorney General, effective August 9, that allowed the continuation of exporting of gold in ore and in concentrates and exporting of gold in unretorted amalgam bullion and in unrefined cyanide precipitates. This order permitted export to 75 percent of the United States gold-mine production but made it impracticable for the remaining 25 percent, a situation which would have soon resulted in the closing of many smelters (even then working only on part capacity).

Owing to the difficulties of quickly contacting reliable purchasers abroad, relatively very little of the above classified material was exported, although in the interim preparations had been made by some producers and were being made by other producers to ship abroad, when the President on August 29 issued an Executive order, coupled with an anti-hoarding clause, that the United States Government

MINE PRODUCTION OF GOLD IN THE UNITED STATES, BY STATES, 1936-37

State or Territory	1936	1937	Increase (+) or decrease (-)		Value at \$35 per ounce	
	Fine ounces	Fine ounces	Fine ounces	Percent	1936	1937
<i>Western States and Alaska</i>						
Alaska	540,580	582,600	+ 42,020	+ 8	\$ 18,920,300	\$ 20,391,000
Arizona	322,408	338,500	+ 16,092	+ 5	11,284,287	11,847,500
California	1,077,442	1,164,400	+ 86,958	+ 8	37,710,470	40,754,000
Colorado	366,607	367,554	+ 947	+	12,831,245	12,864,390
Idaho	80,291	78,000	- 2,291	- 3	2,810,199	2,730,000
Montana	180,209	203,400	+ 23,191	+ 13	6,307,322	7,119,000
Nevada	286,370	276,100	- 10,270	- 4	10,022,950	9,663,500
New Mexico	33,037	41,125	+ 8,088	+ 24	1,156,295	1,439,375
Oregon	60,753	52,700	- 8,053	- 13	2,126,355	1,844,500
South Dakota	586,353	582,000	- 4,353	- 1	20,522,369	20,370,000
Texas	613	550	- 63	- 10	21,455	19,250
Utah	223,444	327,000	+103,556	+ 46	7,820,540	11,445,000
Washington	12,217	31,600	+ 19,383	+159	427,609	1,106,000
Wyoming	1,964	1,768	- 196	- 10	68,754	61,880
	3,772,288	4,047,297	+ 275,009	+ 7	\$132,030,150	\$141,655,395
<i>Central State</i>						
Michigan		51	+ 51	+...	\$.....	\$ 1,785
<i>Eastern States</i>						
Alabama	4,726	2,450	- 2,276	- 48	\$ 165,410	\$ 85,750
Georgia	450	704	+ 254	+ 56	15,735	24,640
Maryland	668	1,017	+ 349	+ 52	23,380	35,595
North Carolina	2,037	935	- 1,102	- 54	71,301	32,725
Pennsylvania	890	1,335	+ 445	+ 50	31,150	46,725
South Carolina	287	2,343	+ 2,056	+716	10,059	82,005
Tennessee	410	350	- 60	- 15	14,350	12,250
Virginia	909	1,402	+ 493	+ 54	31,814	49,070
	10,377	10,536	+ 159	+ 2	\$ 363,199	\$ 368,760
Philippine Islands	*599,657	*694,900	+ 95,243	+ 16	\$ 20,987,995	\$ 24,321,500
Puerto Rico	*482	*17	- 465	- 96	16,870	595
	600,139	694,917	+ 94,778	+ 16	\$ 21,004,865	\$ 24,322,095
Total	4,382,804	4,752,801	+369,997	+ 8	\$153,398,214	\$166,348,035

* Refinery receipts.

would act as agent for producers of newly mined gold to obtain the world price through the United States Mint and Federal Reserve banks; regulations were promulgated to pay the producer by Federal Reserve bank check (when sale was consummated) at the world price received by the Federal Reserve bank. All sales were handled by the Federal Reserve Bank of New York. This bank made a small quantity of sales internally to commercial companies for industrial purposes at world prices but sold the large amount abroad. The period covered by the internal sales was September 8 to October 27; the period covered by sales abroad was September 13 to November 1.

On October 25 the Reconstruction Finance Corporation began buying newly mined gold at arbitrarily fixed and periodically rising prices, the day-by-day price generally being above the world price; payment to the producer was in Reconstruction Finance Corporation notes payable in principal and interest on February 1, 1935. On October 27 the Reconstruction Finance Corporation was authorized by Presidential order to extend Government purchase of gold by entering foreign markets and began to bid for gold in Paris and London markets, offering \$32.36 an ounce. On January 16, 1934, the Federal Reserve Bank of New York began paying depositors by check the United States price of \$34.45 per ounce, less a small com-

mission, coincident with the President's message of January 15 to Congress recommending that the upper limit of permissible revaluation of the dollar be 60 percent. Payment for deposits was resumed on February 1 by the Bureau of the Mint, following passage of the Gold Reserve Act of 1934 on January 30, 1934, and the President's proclamation of January 31 acting under the powers granted by title 3 of the act approved May 12, 1933 (Thomas amendment to the Farm Relief Act), fixing the weight of the gold dollar at 15 5/21 grains, nine-tenths fine. This is 59.06+ percent of the former weight of 25 8/10 grains, nine-tenths fine, as fixed by section 1 of the act of March 4, 1900. The value of gold per fine ounce immediately became \$35, where it has since remained.

Comparison of United States gold and silver stock with United States production.—At the end of 1937 the United States stock of gold was 364,570,849 ounces; mine production from 1792 has been approximately 244,692,932 ounces. The stock of silver was 2,176,900,000 ounces; total mine production has been 3,458,499,503 ounces.

Gold and silver used in industrial arts in the United States during the calendar year 1936.—The United States Mint shows that \$32,967,938 was issued in 1936 for industrial arts,

but \$35,875,770 worth of old jewelry was returned to the Mint.

Mine Production of Gold in the United States in 1937

The table opposite shows the mine production of the United States, by States, in 1937 compared with 1936. The table shows the number of fine ounces increase or decrease, and percentages.

Alaska.—The increase in production came from dredges and placers.

Arizona.—The increase came mainly from increased operations of porphyry copper mines.

California.—The increase came from lode mines of Grass Valley-Nevada City district.

Colorado.—The maintenance of production resulted from increased output of copper-silver-gold ore and the renewal of production of zinc-lead-silver-gold ores.

Idaho.—The decrease was in lode output.

Montana.—The increase was from lode mines, for placer production decreased.

Nevada.—Despite an increase from copper mines, decreased output from dry and siliceous ores resulted in a net decrease.



"Caterpillar" Diesel RD8 with LeTourneau bulldozer stripping overburden, leveling and covering tailings on gold dredging operation near Camanche, California

**MINE PRODUCTION OF SILVER IN THE UNITED STATES, BY STATES AND REGIONS, 1936-37,
IN TERMS OF RECOVERED METAL**

State or Territory	1936 Fine ounces	1937 Fine ounces	Increase (+) or decrease (-)		Value	
			Fine ounces	Percent	1936 at \$0.7745 per ounce	1937 at \$0.771 per ounce
<i>Western States and Alaska</i>						
Alaska	427,592	632,000	+ 204,408	+ 48	\$ 331,170	\$ 487,272
Arizona	8,386,043	9,000,000	+ 613,957	+ 7	6,494,990	6,939,000
California	2,103,799	2,865,000	+ 761,201	+ 36	1,629,392	2,208,915
Colorado	5,902,776	6,095,195	+ 192,419	+ 3	4,571,700	4,699,395
Idaho	14,537,530	19,500,000	+4,962,470	+ 34	11,259,317	15,034,500
Montana	11,600,563	11,540,000	- 60,563	- 1	8,984,636	8,897,340
Nevada	5,068,786	4,536,000	- 532,786	- 11	3,925,775	3,497,256
New Mexico	1,163,255	1,263,420	+ 100,165	+ 9	900,941	974,097
Oregon	85,061	66,400	- 18,661	- 22	65,880	51,194
South Dakota	144,448	143,000	- 1,448	- 1	111,875	110,253
Texas	1,361,459	1,303,000	- 58,459	- 4	1,054,450	1,004,613
Utah	9,997,645	12,844,000	+2,846,355	+ 28	7,743,176	9,902,724
Washington	66,900	100,000	+ 33,100	+ 49	51,814	77,100
Wyoming	1,113	199	- 914	- 82	862	153
	<u>60,846,970</u>	<u>69,888,214</u>	<u>+9,041,244</u>	<u>+ 15</u>	<u>\$47,125,978</u>	<u>\$53,883,812</u>
<i>Eastern States</i>						
Alabama	869	460	- 409	- 47	\$673	\$355
Georgia	28	45	+ 17	+ 61	21	35
Maryland	33	40	+ 7	+ 21	26	31
New York	18,251	41,500	+ 23,249	+ 127	14,135	31,996
North Carolina	5,575	4,260	- 1,315	- 24	4,318	3,284
Pennsylvania	8,118	7,634	- 484	- 6	6,287	5,886
South Carolina	50	590	+ 540	+1,080	39	455
Tennessee	50,330	61,000	+ 10,670	+ 21	38,980	47,031
Virginia	96	115	+ 19	+ 20	75	89
	<u>83,350</u>	<u>115,644</u>	<u>+ 32,294</u>	<u>+ 39</u>	<u>\$64,554</u>	<u>\$89,162</u>
<i>Central States</i>						
Illinois	1,780	893	- 887	- 50	\$1,379	\$688
Michigan		27,450	+ 27,450	.....		21,164
Missouri	163,720	177,412	+ 13,692	+ 8	126,801	136,785
	<u>165,500</u>	<u>205,755</u>	<u>+ 40,255</u>	<u>+ 24</u>	<u>\$128,180</u>	<u>\$158,637</u>
Philippine Islands	*467,885	*628,900	+ 161,015	+ 34	*\$302,377	*\$484,882
Puerto Rico	*187	*1	- 186	- 99	*145	1
	<u>468,072</u>	<u>628,901</u>	<u>+ 160,829</u>	<u>+ 34</u>	<u>\$302,522</u>	<u>\$484,883</u>
Total	61,563,892	70,838,514	+9,274,622	+ 15	\$47,681,234	\$54,616,494

* Refinery receipts.

New Mexico.—Gold increase came both from increased copper ore production and dry ore production.

Oregon.—Oregon's decrease was both in lode and placer mines.

South Dakota.—South Dakota's decrease was merely a slight reduction in output of the Homestake mine.

Utah.—Utah's increase came mainly from increased copper ore output.

Washington.—Installation of new cyanide mills increased Washington's output.

SILVER

The mine production of silver in the United States and the Philippine Islands in 1937 was 70,838,514 ounces, an increase of 15 percent over the 1936 output of 61,563,892 ounces. The increase in quantity of 1936 over 1935 was 26 percent; 1935 over 1934,

48 percent; 1934 over 1933, 41 percent; and 1937 over 1933, 204 percent.

Review of Price Changes

The record low price of silver was 24 $\frac{7}{8}$ cents per ounce on December 3, 1932. The average price of silver in New York in January 1933 was 25.40 cents. The silver price responded during the year to the increased price of gold. In December 1933, the New York price of silver was 43.55 cents. On December 21, 1933, President Roosevelt issued a proclamation that gave 64.6464+ cents per ounce to the United States producers of newly-mined silver. On April 10, 1935, the United States price to domestic producers was increased to 71.11+ cents an ounce and on April 24, 1935, to 77.57+ cents per ounce, where it remained until December 31, 1937, when it was reduced to 64.6464+ cents to December 31, 1938.

World price of silver.—The Silver Purchase Act of 1934, signed by the President June 19, 1934, permitted the nationalization of silver; declared the policy of the United States to be the acquisition of a silver reserve one-third as large as the gold reserve; authorized the Secretary of the Treasury to purchase silver (at home and abroad, until the monetary reserve strength of silver amounted to 25 percent or until the price had advanced to \$1.29 an ounce. Handy and Harmon, metal brokers, New York City, give an average New York official price of 44.883 cents per ounce in 1937, compared with 45.087 cents in 1936.

Treasury Holdings

Purchases under the Silver Production Act of 1934 to December 31, 1937, plus purchases of newly mined silver, plus silver stocks previously on hand, gives a total of 2,176,900,000

ounces of Treasury silver holdings on December 31, 1937. Based on gold stocks of the same date of \$12,760,000,000, additional acquisitions of silver to the amount of about 1,113,000,000 ounces are still needed to fulfill the requirements of the Silver Purchase Act.

World production of silver.—World production of silver in 1937, according to Handy and Harmon was about 276,000,000 ounces. Of this the United States produced about 68,400,000 ounces, Mexico, 88,000,000, Canada 24,300,000, South American, 32,300,000, and all other countries about 63,000,000 ounces.

Mine Production of Silver in the United States in 1936-37

The table opposite shows the production of silver, by States, in 1936 and 1937, with increase or decrease in ounces, and percentages.

Alaska.—Increased output came from copper ore production at Kennecott.

Arizona.—Increased output came from copper ore.

California.—Increased output came from copper ore in Plumas County, silver ore from Mono County, and silver-gold ore from Kern County.

Colorado.—Colorado production was maintained by increased shipments of copper-silver-gold ore.

Idaho.—Increases were from silver ore of the Coeur d'Alene region, Shoshone County.

Montana.—Montana's decrease came from a decrease of zinc-lead-silver ores.

Nevada.—Nevada's decrease was caused by decreased output of zinc-lead-silver ore.

New Mexico.—New Mexico's increase was from both zinc-lead and dry gold-silver ores.

Texas.—Texas' small decrease was in decline of copper-silver smelting ore shipments.

Utah.—Utah's increase was from copper and zinc-lead ores.

FERRO-ALLOYING MINERALS[†]

• Domestic Productive Capacity Showed Important Increases for Tungsten, Molybdenite, and Vanadium Ore

HIGHER prices were the rule for ferro-alloying minerals during 1937. Reacting to the accelerated activity in the steel industry at home and abroad, demand for ferro-alloying raw materials increased so decidedly that the sources of supply were pressed to meet requirements. Furthermore, the extensive armament activities of

the great powers created demands in addition to those necessary for general improvement in the world iron and steel industry. For some of the commodities, including high-grade manganese ore, chromite, and tungsten concentrates, little or no material was available for spot delivery during the year.

For many ferro-alloying mineral raw materials, including manganese

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ore, chromite, tungsten concentrates, and vanadium ore, the United States requires substantial imports to supply domestic requirements. Imports were much higher in 1937 than in 1936,



Camp of Nevada Massachusetts Company, tungsten operation, near Mill City, Nevada



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and in most instances record figures will be reached. Much of this foreign supply is transported long distances by foreign vessels over ocean routes and priced c. i. f. American ports. The stringency in shipping resulting from ships of other nations being used by their own principals, and the resultant higher ocean freight rates, were therefore indicated by the prices domestic consumers were forced to pay. The higher quotations on foreign material stimulated the search for and opening up of new deposits, not only in this country but also in many other nations throughout the world. The sharp recession in the domestic steel industry during the last quarter of the year, however, released the pressure on the domestic market, and prices though still high were off somewhat.

Tungsten Ore

The most striking advance was noted for tungsten ores and concentrates; the quotations on the domestic product more than doubled, reaching a high of \$35 a unit late in September. The condition of the tungsten market was aggravated further by the war in China, which threatened to disturb the flow of tungsten concentrates from that country, normally the principal source; nevertheless, exports from China were high, and according to official figures amounted to 15,072 metric tons during the first 10 months of 1937, compared with 5,854 tons during the same period of 1936. World supplies, however, were tight and assurance of delivery was difficult to obtain.

Imports for consumption into the United States during the first 10 months of 1937 totaled 4,752 short

tons containing 2,599 tons of tungsten, more than double the 1936 figure for the same period. Sixty-nine percent of the 1937 imports came from China.

In the United States many new producers appeared during the year. New properties were prospected and developed, old mines reopened, and old dumps reworked. Several new milling plants were under construction or completed during the year. The United States Vanadium Corporation was completing a 250-ton plant at Pine Creek, near Bishop, Calif. The Nevada Tungsten Corporation erected a 100-ton mill near Gardnerville, Nev., and the Tungsten Corporation of California completed work on a 150-ton plant near Benton Mills, Inyo County, Calif. New equipment installed during the year doubled the capacity at Ima Mines Corporation, May, Idaho. As a result of these developments and the construction of a number of other smaller mills in Arizona, California, Colorado, Nevada, and Washington domestic output in 1938 will probably show an increase if prices are maintained. The mill at the Boriana mine, 10 miles east of Yucca, Ariz., burned late in the year. This property, one of the principal domestic producers, was leased to the Molybdenum Corporation of America early in 1937.

chromite is of good metallurgical grade containing 53 percent Cr_2O_3 , with a suitably low iron content. Metallurgical-grade chromite, though of somewhat lower quality, came from the Acoje mines in Zambales, while the large deposit (10,000,000 tons) in Masinloc supplied chromite for refractory uses. Smaller shipments originated on Homonhan Island, where the chromite is recovered from lode operations and from the sluicing of chromite-bearing sands.

As a result of the market conditions in recent years, one domestic consumer has explored and developed domestic deposits in Oregon and California. Shipments by water from San Francisco and Portland were begun in 1937, and domestic production probably will exceed that for any year since 1920. The chromite is reported to be of good grade and was taken to a metallurgical plant on the eastern seaboard. Much other activity in chromite exploration was evident during 1937, particularly in Washington, Oregon, and California, and several other operators may contribute smaller amounts to the domestic total. The old producing district near the Maryland-Pennsylvania State line attracted some attention, and it was recently reported that one of the old mines is being pumped out.

Southern Rhodesia has resumed its

TABLE I.—QUOTED DOMESTIC PRICES ON FERRO-ALLOYING MINERALS IN 1937 *

Commodity	Jan. 1	Apr. 1	July 1	Oct. 1	Dec. 31
Chromite—50% grade—per long ton.....	\$20.00	\$25.00	\$25.00	\$26.00	\$26.50
Manganese ore—50-55% grade—long-ton unit..	.30	.34	.44	.55	.45
Scheelite, domestic, good quality—short-ton unit.	16.50	21.00	22.00	35.00	24.00
Molybdenite—90% conc.—lb. of contained MoS_2	.42	.42	.42	.42	.42
Vanadium ore—per lb. of contained V_2O_5.....	.27½	.27½	.27½	.27½	.27½

* Engineering and Mining Journal—Metal and Mineral Markets.

Chromite

Virtually all of the domestic consumption of chromite since the World War has been supplied from foreign sources. Imports during 1937 established a new record, and for the first 10 months were running 65 percent ahead of last year. Aside from the larger takings of Rhodesian and South African chromite, the increased shipments from the Philippine Islands, a new producing source, are of interest. Imports increased from 1,108 long tons for the first 10 months of 1936 to 35,048 tons for the same period in 1937. A large part of the shipments came from the Florannie deposit in Camarines Sur, where the

position as the leading world source but is being pressed by Turkey and the U. S. S. R. Of interest from an international standpoint is the development of the new deposit in Turkey, near Ergani. This deposit, which is reported to be extensive, contains good-grade chromite suitable for metallurgical use, and the development now under way will permit exports of large quantities.

Prices continued to move upward during 1937, and at the end of the year domestic trade journals were quoting imported ore (50 percent grade) at \$26.50 per long ton. Supplies of good-grade ore for spot shipment have been scarce.



Tungsten operations of Ima Mines Corporation, near May, Idaho

Manganese

World sources of manganese ore reacted to the pressure of increased demand in 1937, and indications are that production will be the largest on record. Supplies were light, and in some instances prices of imported ore for domestic delivery doubled.

Domestic production of manganese ore likewise was stimulated by high prices, and while the demand for domestic ores was better than in 1936, there were no outstanding developments. A number of new and small operations were inaugurated, but the increase in domestic production was due largely to the greater output in Montana, the principal producing State, where production of sintered rhodochrosite at Butte was revived actively. The mill at Moorlight mines in the Philipsburg district burned on May 14, and the company purchased the near-by mill of the Trout Mining Division of the American Machine & Metals Co., which will construct a new and modern plant near the Trout mine. Meanwhile the Trout mill will operate on ores from both Moorlight and Trout operations. The increase in the domestic output fell far short of requirements, which undoubtedly reached a new peak in 1937, and the larger demand was met by record imports, which for 10 months were 26 percent higher than during the same period for 1936. In fact, imports during the first 10 months of 1937 exceeded the record figure for the entire year 1936. Russia continued to be the chief supplier of our requirements (40 percent for 10 months of 1937), principally from the mines at Chiaturi, where two large mills are under construction. The mines in this district are being equipped with new machinery, and transportation from mines to ore-dressing mills is being mechanized. Nearer

home, Cuban production and shipments increased not only in consequence of higher prices but also as a result of improved technology at the principal producing plant, which raised recovery and reduced costs.

Molybdenite

Molybdenite is one of the few common ferro-alloying minerals of which the United States has ample supplies for its own needs. World output touched a new high in 1937, due principally to the record production from American mines, which furnish the bulk of the production.

Demand was strong both at home and abroad, and the principal domestic producer, the Climax mine, was pushed to capacity to meet orders. The new mill at this property, which more than doubled the capacity to 10,000 tons of ore a day, was completed and put into operation early in 1937. Output at this property totaled 22,600,000 lb. of Mo. Of importance in 1937 were the production and shipments of molybdenite concentrates from the copper ores of the Utah Copper Co. at Bingham, Utah; this company became the second largest world producer

during the year. Molybdenite is recovered by flotation at both the Magna and Arthur mills, and the ore as it comes from the mines is reported to contain about 0.05 percent molybdenite. Although parts of the mine carry higher molybdenum values, no attempt has been made to mine selectively, as molybdenite production is entirely by-product. The concentrates are of good grade, but care must be exercised regarding the copper and pyrite content. Molybdenite is also being produced by Kennecott at Hurler, N. Mex. Other supplies are being derived from several smaller producing properties, and the total output from domestic mines in 1937 may reach 30,000,000 lb. of molybdenum.

Vanadium Ore

Vanadium ore, likewise, felt the pressure of increased demand in 1937 and was imported into this country at a much higher rate than in 1936. For the first 10 months imports amounted to 6,038 long tons, containing 522 tons of V, compared with 1,667 tons containing 153 tons of V during the same period in 1936. All these imports originate in Peru.

A new plant for the treatment of



Climax, Colorado

150 tons a day of low-grade carnotite ores from Paradox Valley was completed late in 1936 at Uravan, Colo., by the United States Vanadium Corp., and the first carload was shipped early in 1937. About midyear it was reported that the company will double the capacity of the plant. Reserves are said to suffice for several decades of operation. The International Vanadium Corporation at Globe, Ariz., completed its mill and power plant during the first half of 1937 and continued the development of the Dripping Springs mine. It was reported that the Utah Vanadium Corporation had started production from its new mill on the Dolores River, near Cedar, Colo., and has shipped concentrates from its properties in Grand County, Utah, about 8 miles west of Gateway, Colo. A 30-ton mill was also being installed on the Shumway property near Blanding, in San Juan County, Utah. These developments may go a long way toward making the United States independent of foreign supplies.

TABLE II.—IMPORTS FOR CONSUMPTION IN THE UNITED STATES OF FERRO-ALLOYING MINERALS, JANUARY TO OCTOBER, 1936 AND 1937

Commodity	1936	1937	Percent increase	Principal sources
Chromite .....long tons..	279,684	460,450	65	So. Rhodesia and Cuba
Manganese ore .....do....	674,863	849,323	26	U.S.S.R. and Gold Coast
Tungsten ore.....short tons..	2,188	4,752	117	China and British Malaya
Vanadium ore.....long tons..	1,667	6,038	262	Peru

Purely nominal quotations for vanadium ore were unchanged through 1937 at 27½ cents per pound of contained V₂O₅.

Strategic Stock Piles

An amendment to the Naval Appropriations Bill for the fiscal year 1938 appropriated \$3,500,000 to purchase strategic and critical materials, the total amount to remain available until spent. Under authority of the amendment the Secretary of the Navy authorized the expenditure of \$1,500,000 for such purchases during the current fiscal year. The materials to be pur-

chased include the following mineral commodities: Tin, chromite, tungsten ore or concentrates, and manganese ore. The Department has already made its tin purchases and received bids on manganese ore, together with alternate bids on low-grade ferro-manganese, on October 29. The bids, however, were rejected because the material was not considered satisfactory, and the specification is now being reconsidered. The specifications and schedules on chromite and on tungsten ore or concentrates have been prepared, and the bids on chromite were called for January 4.

IRON and STEEL METALLURGY†

• Important Progress Indicated in Desulphurization and Application of Full Automatic Control. Trend Continues Toward Low Alloy Steels

FOLLOWING are some of the developments in the metallurgy of iron and steel during the past year:

The trend appears to be toward fewer but larger blast furnaces, the 400 to 500-ton units being displaced by 1,000 to 1,100-ton furnaces. One of the advantages noted for the larger furnaces is greater life of furnace linings, many of them being good for 2,000,000 tons of iron.

Progress has been made in the method of operation of a blast furnace wherein a furnace is burdened to give a slag of minimum melting point and viscosity without regard to the sulphur content of the pig iron. The

excess sulphur is removed in the transfer ladle and mixer by the addition of desulphurizing agents, of which sodium carbonate is the most active ingredient. Sufficiently large tonnages have been manufactured by this process in England and on the continent to establish it on a commercial basis where iron and steel containing sulphur in the range of 0.03 to 0.05 percent are satisfactory. The method appears to offer advantages where high-sulphur ore or coke must be used or where unusual slags are encountered, but this is not an immediate problem in this country. In the United States efforts are being directed toward the application of desulphurization in the ladle to the production

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of iron containing less than 0.020 percent sulphur for deep drawing stock. Phair (*The Iron Age*, August 5, 1937) and Cullough (*Iron and Coal Trades Review*, September 3, 1937) give a good review of the practice.

The use of thermocouples to give a

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continuous record of temperatures at important points in the upper part of the blast furnace continues to account for improvement in furnace operation. Furnace irregularities can be rapidly detected and the burdening corrected to give more uniform gas distribution and gas-solid contact.

Automatic Control

An important advance in steel-making is the adoption of full automatic control of fuel, air draft, pressure, and temperature in the operation of a number of new open-hearth furnaces wherein the human element is largely eliminated. Automatic control of roof temperature permits a higher average operating temperature without danger of overheating the roof and shortening its life.

Ferrous scrap received much attention during 1937 because of its extensive use in the United States and abroad, exportations, politics, the high price at mid-year and the present low price. The Bureau of Mines is now making regular canvasses of the consumption of scrap. The returns from 2,900 active plants in 1936 were presented by Ridgway, Davis, and Trought in *Report of Investigations* 3366, November, 1937. Countries that lack large deposits of iron ore are eager to obtain scrap from any possible source.

Analysis of scrap for residual metals which has been made since 1927 is again reported in the *Proceedings* of the Open-Hearth Committee of the American Institute of Mining and Metallurgical Engineers. No marked changes except in manganese, which is added to pig iron, are recorded.

Slag Control

According to Simon (*Metal Progress* for October, 1937) the refinements in carbon-steel manufacture have been of such importance that producers and consumers alike are viewing the future with considerable interest. Slag control has been practiced to an increasing extent. The use of slag viscosity and the examination of slag pancakes are the preferred methods.

Thum and Monypenny, respectively, in *Metal Progress* for October, 1937, review trends in alloy steels in America and in England. The trend in both countries is to low-alloy steels, especially those containing chromium alone or with a little vanadium.

Steels with high alloy content continue to be made in the electric furnace whereas steels of low alloy content are made in the open-hearth and bessemer processes, according to Ridgway and Davis (*Minerals Yearbook*, 1937).

Among the new steels which promise to be of some importance is the so-called graphitic steel combining the free machining and resistance to wear of cast iron with the response to heat treatment and forgeability of steel. A typical analysis is 1.48 percent carbon, 0.40 percent manganese, 0.90 percent silicon. The development is fully described by Boute and Fleischmann (*Metal Progress* for April, 1937).



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Electric steel had its biggest year of output in 1936, although 1937 may eclipse this record. The products are ingots and castings of plain steel and of alloy steel. During 1936, according to Ridgway, Davis and Trought in *Report of Investigations* 3366, Bureau of Mines, 1937, 240 electric-furnace plants melted 641,000 tons of plant or home scrap and 606,000 tons of purchased scrap, but only

23,000 tons of pig iron.

In addition to dinas and magnesite bricks the use of a new type of chromite-magnesite brick known as Siemensite is increasing. This brick is made from molten slag produced in the manufacture of low carbon ferrochromium by the Haglund process. The raw materials are chromite, magnesite, and bauxite and the bricks contain about 35 percent Cr_2O_3 , 25 percent MgO , and 35 percent Al_2O_3 .

Refractory Practice

Up-to-date refractory practice is covered completely in the Harbison-Walker Refractories Company's new 295-page text, *Modern Refractory Practice*. This is a valuable and practical reference, well illustrated with

bricks and shapes and the furnaces where they are used.

New developments not yet fully industrialized which promise to be of importance to the steel industry are the applications to steel of the direct rolling process which has been successful for non-ferrous metals, and the electrolytic production of high purity manganese reported by the United States Bureau of Mines. Both of these processes were selected by the National Resources Committee among the five new developments of the year most likely to affect industrial practice.

Research Laboratories

Fairly frequently of late have we read of or been invited to the opening of new laboratories. The newest is that of the American Rolling Mill Company at Middletown, Ohio, and a little earlier that of the Columbia Steel Company, Pittsburg, Calif. These are principally for iron and steel. In Detroit, Mich., the Climax Molybdenum Company occupied a new laboratory earlier in the year. This one is concerned with molybdenite, molybdenum, ferro-molybdenum, and calcium molybdate, all related to iron and steel. By such organization the industry develops new products and keeps up with customers' requirements.

Two additional monographs of the series *Alloys of Iron Research*, The Engineering Foundation, appeared during the year. These were—Volume 2 (Properties) *The Alloys of Iron and Carbon*, by Frank T. Sisco, and Volume 1 (Low-Chromium Alloys) *The Alloys of Iron and Chromium*, by A. B. Kinzel and Walter Crafts. At the rear of each book is a bibliography of hundreds of references and good name and subject indexes. The iron-carbon volume is the final portion of a correlation of data and a critical summary of world knowledge on the constitution and properties of iron-carbon alloys, and is more likely to be used as a reference work than others of the series on cast steels, hot and cold-worked and heat treated steels, cast iron, malleable iron, creep tests, corrosion, and miscellaneous engineering properties. The iron-chromium volume is restricted to a correlation of world knowledge of the alloys containing less than 10 percent chromium. The manufacture and properties of such steels are fully covered. The addition of chromite instead of ferrochromium to the bath is explained.

Monographs on iron and nickel and on iron and manganese are in preparation.

BITUMINOUS COAL

• Several Factors Effective in Making 1937 Production Highly Irregular

THE influence of three factors contributed to make the demand for bituminous coal, and hence the rate of operation of bituminous mines, even more irregular in 1937 than in normal years. These factors were the wage conference in the first quarter of the year, the business depression, the influence of which was increasingly felt during the last half of the year, and the establishment of prices by the National Bituminous Coal Commission in December.

During the first quarter of the year the output of bituminous coal exceeded that of the same period of 1936 by 21,294,000 tons, or 18.9 percent. Some part of this increase was undoubtedly due to the relatively high rate of business activity, but uncertainty as to the outcome of the wage conference preceding the expiration of the 1936 wage agreements on March 31, 1937, was the outstanding influence at work in increasing demand.

This is shown by the fact that after the signing of the new wage agreement demand fell precipitately. The output in April, 1937, was more than 4,500,000 tons less than the output of April, 1936. In the week ended March 27 operators produced 11,368,000 tons; in the week of April 10—two weeks later—5,821,000 tons, a decline of 48.8 percent. In May production recovered somewhat, but during the summer and fall it was obviously affected by the declining rate of business activity. For the five months, May to September, inclusive, 1937 production was approximately 4 percent ahead of the 1936 output for the same months.

Business Slump Slows Output

During the last quarter of the year the effect of the business decline was more sharply felt, and in spite of the stimulus to demand due to the activities of the National Bituminous Coal Commission and the expected increase in the prices established by them over prevailing prices, the output for the last quarter was nearly 15,000,000

By J. D. BATTLE
Executive Secretary
National Coal Association

tons less than the output for the same quarter of 1936. The actual establishment of prices by the Commission in the middle of December came too late to have much effect upon the aggregate last quarter's production. The final result was that the total output for 1937 was only approximately 1 percent higher than the output for the year 1936. Comparative consumption during the year was even less, since some four million tons more were added to industrial stocks in 1937 than in 1936.

New Wage Agreement

In anticipation of the expiration of the 1936 wage agreement, meetings of joint committees of operators and mine workers to negotiate a new scale began in February, 1937, and reached a final agreement on April 2. It was provided that the new agreement should run to March 31, 1939. Under this agreement an increase of 10 percent, or its estimated equivalent, was granted to mine workers in different occupations; and for the first time in the history of wage agreements in the bituminous mining industry a provision was made for payment at the rate of time and a half for overtime in excess of 7 hours in one day or 35 hours in one week. Because of the restricted demand for bituminous coal since the new agreement went into effect, most mines have been able to operate with comparatively little overtime, and the time-and-half provision has had correspondingly little effect upon the labor cost of producing bituminous coal. However, if an emergency should arise calling for a substantial and especially a sudden increase in the output of bituminous coal, more overtime would have to be worked and costs of production would be thereby increased.

The advance in the regular rates of



J. D. BATTLE

pay made itself felt immediately in increased labor costs. This advance came on top of three previous substantial advances—those of October, 1933; April, 1934; and October, 1935. The cumulative result of all these increases, including that of April, 1937, was an advance in the total cost of producing bituminous coal of something over 60 cents per ton, or approximately 85 percent.

Necessitated Lower Costs Through Mechanization

In the attempt to meet this increased cost of production through proportionate advances in price, the industry was faced with the possibility of the adoption of substitute sources of energy by its customers. The steadily expanding use of fuel oil, natural gas, and hydro-generated electricity during recent years proves conclusively that the fear of such substitution is well grounded. The alternative course open to mine operators was the lowering of the cost of production. The most obvious and important method through which such lowering of cost could be accomplished was through the adoption of labor-saving devices, all the more important from the point of view of the mine operator because labor cost constitutes so large a proportion of the total cost of production.

The result is seen in the rapid rate of increase in the output of stripping mines, in which labor cost is reduced to a minimum, and in the installation of mechanical loading devices in underground mines. In 1927 approximately 3.5 percent of the total output of the bituminous industry came from

stripping mines; in 1937 the output had increased to well over 6 percent of the total. Even more striking has been the increase in the use of mechanical loading devices. In 1927 a little over 3 percent of the output of underground mines was loaded mechanically; in 1937 the percentage had increased to approximately 14. This record furnishes a striking illustration of the general principle that whenever any particular factor in the cost of production of a commodity, whether the cost of labor or the cost of supplies, increases abnormally, substitutes for such factor will inevitably be adopted.

Advertising Campaign Effective

As another method of holding its market against rival fuels in the face of advancing costs of production and resulting higher prices, the industry, through the National Coal Association, began in 1937 the first nation-wide advertising campaign in the history of the industry. The campaign was inaugurated about the middle of the year and time has been too short for the full benefit of such advertising to be realized, but the results have been very encouraging, so much so that the program will not only be continued but substantially enlarged during the coming year. So far as these efforts have been specialized they have been directed particularly toward the increase in the consumption of bituminous coal as a household fuel.

Federal Regulation

The great event of the year, both from the point of view of the industry and from the point of view of the relations of Government to business, was the revival of the attempt to bring the industry under Federal regulation. This was embodied in the National Bituminous Coal Act of 1937. This act was signed by the President on April 26, 1937. The driving force relied upon to achieve the purposes of the act lies in the power bestowed upon the seven-member commission created under it to establish and enforce minimum prices for bituminous coal at the mine.

The method to be followed by the commission in arriving at such minimum prices is set forth in detail in the act itself. It involved the ascertainment of the weighted average cost of producing coal in 1936 in each of

the 10 minimum-price areas into which the act divides the country; the classification of the mines in each of the 23 recognized producing districts on the basis of the physical, chemical, and commercial characteristics of the coal produced by them; and the establishment of minimum prices in each district for each class of mines for each size produced by it. Even those prices were not to be uniform for all shipments; in order to meet competitive conditions, they were to vary according to which of the 157 marketing areas established by the commission the coal was to be shipped into. Further complications were introduced by such factors as the possible absorption of freight rates and special prices for specified classes of consumers.

The result is not a minimum price for bituminous coal but many thousands of minimum prices, all supposed to be so adjusted that the average realization of all the operators in any minimum price area will equal "as nearly as may be" the weighted average 1936 cost of production in the same area. In view of the magnitude and complexity of the task, it is not surprising that prices were not actually put into effect by the commission until the middle of December.

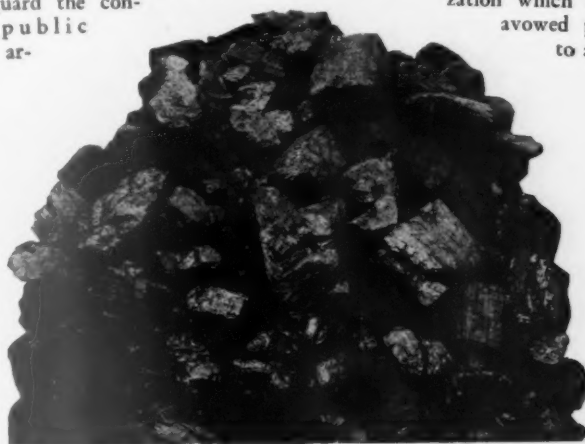
Under the terms of the act the control of the Bituminous Coal Commission over prices extends to the wholesaler but not to the retailer. As a general rule, wholesalers must charge not less than established mine prices, the wholesaler's commission taking the form of prescribed deductions by the operator from the mine price in the case of coal shipped to the wholesaler.

The act attempts to protect the interests of the consumer through providing for the appointment of a consumers' counsel, whose duty it is to safeguard the consuming public against ar-

bitrary or excessive prices. However, his control, like that of the commission itself, does not extend beyond the wholesaler. The domestic consumer, buying coal in less than carload lots, must still pay whatever price the retailer finds it advantageous to charge.

The commission has undertaken to assist the domestic buyer by readjusting the relative prices of domestic and industrial sizes submitted by the district boards, adding from 5 to 20 cents a ton to the submitted prices for industrial sizes and reducing the prices for domestic sizes from 5 to 15 cents a ton. Obviously, under this plan the retailer will be the first to profit by these reductions. The commission has no power to compel him to pass the benefit of the price concession on to domestic consumers. Because of this situation the chairman of the commission has announced that "This commission does not propose to stand silently under any allegation that this action will bring about general increases in domestic fuel prices. While we do not have the authority of law to regulate retail prices, we will not hesitate to make the facts known at the bar of public opinion." It is going to be interesting to watch the effect of this attempt to alter arbitrarily the relative prices of different sizes of coal, the joint product of the same mine, which relative prices in the past have as a general rule been determined by the relative market demand for such different sizes.

As the first established minimum prices did not go into effect until December 16, the test of the success of this novel experiment in Federal regulation of private business lies in the future. The industry has entered the New Year hoping for the best and prepared to cooperate fully with the provisions of the act, in the hope that it may bring about the stabilization which it is its avowed purpose to achieve.



ANTHRACITE

• *Mild Weather Last Winter Largely Responsible for Lower Production*

AS NEARLY all Pennsylvania anthracite produced is used for heating purposes, its market is largely controlled by weather conditions. Consequently the unseasonably warm weather that prevailed last winter seriously affected the total output for 1937. In January and February alone consumption was 4,400,000 tons less than in the corresponding months of 1936. Commercial production for 1937 will be approximately 48,300,000 net tons, compared with 51,612,000 for 1936.

Exports of anthracite to Canada, however, showed a noticeable gain during the year, the increase for the first 11 months being about 15 percent. The 12-month shipments may approximate 2,000,000 tons, compared with 1,686,000 tons for the previous year, or more anthracite than Canada has taken from the United States since 1930.

The contract between the operators and the United Mine Workers was scheduled to expire April 30, 1938, but following a meeting of the two groups in November, called to consider other matters, it was announced that both sides had agreed to recommend an extension of the wage agreement until April 30, 1939. This action was later ratified by producers and miners, with a reassuring effect on the market.

During the summer the Pennsylvania Legislature made a number of drastic changes in the State's Workmen's Compensation Act, and also enacted a law making occupational diseases compensable. In spite of warnings by the operators that such legislation would lay burdens on the anthracite industry that its income could not support, these measures were written into the statutes to become effective January 1, 1938.

With a few exceptions the anthracite producing companies under the elective provisions of the act rejected same, stating, however, that they would pay without protest the 1937 rate to any injured employee or his dependents. As the year closed a com-

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mittee of operators was meeting with the State's Department of Labor and Industry in an attempt to agree on a fair and workable compensation program.

In a new trade agreement negotiated by the U. S. Department of State with Soviet Russia it was provided that anthracite should enter the United States duty free, instead of meeting a tariff of \$2 per ton as heretofore. This became effective August 6. Secretary Hull announced that Russia had stated that its imports would not exceed 400,000 tons in any one year, although this does not appear as a specific part of the treaty.

Following an extended series of hearings in the case of Ex Parte 115, the Interstate Commerce Commission on October 19 announced a decision allowing increases in the freight rates on practically all commodities carried by Class I railroads, except anthracite. The end of the year found two major cases involving rates on anthracite pending before the Commission, a larger part of the industry in each case being represented by a committee of operators. In one instance a lower rate is being sought from the mines to New York tide, and in the other, Ex Parte 123, the petition of the carriers for a general increase of 15 percent is being opposed insofar as it applies to anthracite. Similar action is being taken by the bituminous interests.

Special Study on Stolen Coal

The problem of stolen coal was made the study of a special commission, known as "The Anthracite Coal Industry Commission," appointed by the Governor of Pennsylvania early in the year, but by the end of the year the solution still seemed far away. The Commission of five made three pre-



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liminary reports early in May, being divided two, two and one as to what should be done. Two of the members held that the unemployed in the southern anthracite region should be treated as unemployed in any other industry. As they said they had no further report to make their resignations were accepted by the Governor, who later filled one of the vacancies thus created.

The majority of the Commission, however, announced in September that it would release its final report in 13 installments, and these appeared intermittently. One of the early installments recommended that the State buy up idle coal reserves that would not be mined for 25 years, paying for them with special bonds. On December 1, however, it was unofficially stated by members of the Commission that they had prepared a bill for the State Legislature which would prorate production among the producing companies and establish a cooperative marketing agency.

In the meantime, the legislatures in Maryland, New Jersey, New York and Connecticut passed laws designed to prevent stolen anthracite from Pennsylvania from entering their markets and disrupting the retail fuel trade. As the New York law did not apply to New York City, an ordinance, effective August 27, was passed by the city council. Most of these measures provided that coal entering the state or city by truck must be accompanied by a certificate showing its origin. Weighing practices were also made more stringent. By the end of the year the flow of stolen coal across Pennsylvania's borders had not been stopped entirely, but was very much curtailed.

A joint bill was introduced in Congress during the summer by Senator Joseph P. Guffey and Congressman Patrick J. Boland, providing for a national commission to supervise the anthracite industry in much the same manner as the National Bituminous Coal Commission governs the bituminous industry. This measure, which is still pending, has been endorsed by some of the anthracite operators and by the United Mine Workers.

Sales Promotion and Research

Meanwhile Anthracite Industries, Inc., which was organized late in June, 1936, by a majority of the operators

to promote the sale of anthracite and anthracite burning equipment, got into full stride during 1937 and but for the unseasonably warm weather the results would have been more apparent in that year. Permanent exhibits have been established in New York, Boston and Philadelphia, seasonal displays were arranged in a number of other cities in the United States and Canada, and a concerted program was worked out with the manufacturers of retail equipment, and with retail dealers. Field representatives are working in territories that cover the entire anthracite consuming area, and the laboratory at Primos, Pa., is continuing to study and improve anthracite burning equip-

ment as originally set up by the Anthracite Institute.

With this background, anthracite enters 1938 with brighter hopes than it has held for some time. The industry has an investment in excess of \$400,000,000 in properties in Pennsylvania, where it employs an army of 100,000 men with a payroll approximating \$150,000,000 annually. It pays \$12,000,000 a year in taxes and provides the railroads with a tonnage that brings in \$108,000,000 annually in freight revenues.

Pennsylvania anthracite, "the solid fuel for solid comfort" is moving forward more aggressively than ever to maintain and expand its markets in the field of domestic fuels.

Distribution of Anthracite Shipments, Prices, Employment and Competitive Fuel Status†

INFORMATION on the distribution of anthracite into its principal consuming areas is far from complete at this time; but, as the production record foretold, shipments to most of the important regions were somewhat smaller than in 1936. Receipts of anthracite by rail and tide in the New England district, including imports for the first 10 months of the year, were about 7 percent less than in the corresponding period of 1936, and for the first 11 months receipts at upper lake docks were about 4 percent less than 1936. Stocks at upper lake docks at the end of November, 1937, were about 8 percent higher than in November, 1936. In producers' yards they were approximately 4 percent lower than at the end of November, 1936.

In the first 11 months of 1937 shipments of Pennsylvania anthracite to Canada showed a gain of nearly 200,000 tons over the corresponding

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period of 1936, while the share in total imports into Canada increased from about 48 percent in 1936 to 55 percent in 1937. The improvement was probably due to lower prices of Pennsylvania anthracite and to high ocean freight rates from Europe. Imports from Great Britain declined about 20 percent and from Germany 18 percent. French Indochina and the Netherlands were out of the Canadian market in 1937, and shipments from Belgium dropped from 30,403 to 8,131 tons. On the other hand Russia, which had made no shipments for a number of years, delivered 132,000 tons in the first 9 months of 1937. It is understood that an agreement was reached between Canadian and Russian authorities under which Russia may ship 250,000 tons a year into Canada.



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The mine price of stove coal declined during 1937 and that of buckwheat No. 1 increased, according to trade-journal quotations. Stove coal, which averaged \$6.82 at the mine during the first 11 months of 1936, averaged \$5.90 per ton for the cor-

responding period of 1937, a decline of 13.5 percent. Buckwheat No. 1, which remained at \$3.25 per ton throughout 1936, averaged \$3.35 for the first 11 months of 1937, an increase of about 3 percent. The average of wholesale prices of chestnut and pea sizes of anthracite (on tracks at destination) for the January-November period of 1937 declined 3.9 and 3.2 percent, respectively, from averages for the like period of 1936, according to figures reported by the Bureau of Labor Statistics, Department of Labor.

The reduced output of the anthracite mines in 1937 accounts for the slight recession in employment and payroll totals indicated by the 11-month index numbers of the Federal Reserve Bank of Philadelphia. The

index of employment for the first 11 months of 1936 and 1937 (1923-25 average = 100) stood at 50.6 and 48.9, respectively, and the index of payroll totals at 37.7 and 36.0, respectively.

Competitive Fuels

Preliminary figures of the National Bituminous Coal Commission for 1937 indicate an increase of 1.4 percent over the 434,070,000 tons of bituminous coal produced in 1936.

It is estimated that during the first 10 months of 1937 the domestic demand for gas oil and distillate fuels, chiefly used for heating buildings, exceeded the demand for these fuels during the corresponding period of 1936 by approximately 15 percent.

In the 10 months ended with October, sales of manufactured gas for domestic use in the New England States, New Jersey, and New York were nearly 2.0 percent less than the 1936 figure; for house heating, however, there was an increase of 16.0 percent over the 1936 period. Sales of natural gas in Pennsylvania for domestic use and house heating declined 2.9 percent under the 1936 figure. Sales of byproduct and beehive coke for domestic heating in 1936 amounted to 10,021,343 tons. No data are as yet available for 1937. However, the total production of byproduct coke in the first 11 months of 1937 exceeded the 1936 period by 15 percent. Imports of both coke and anthracite declined during these 11 months of 1937, the former by 8.7 percent and the latter by 24.8 percent.

ADVANCES in COAL RESEARCH and TECHNOLOGY†

THE year 1937 was noteworthy for the number and quality of meetings devoted to research on coal, representing concerted action to enable coal to compete with other fuels by improved preparation, improved equipment for burning, and intelligent selection. Among the outstanding sessions on these topics were those of the American Mining Congress, May 17 to 20; Fuel Engineers of Appalachian Coals,¹ May 19; American Society for Testing Materials, June 28 to July 2; American Chemical Society, September 6 to 10; National Coal Association, October 7 and 8; joint meeting Coal Division of American Institute of Mining and Metallurgical Engineers and Fuel Division of American Society of Mechanical Engineers, October 27 and 28. The competitive position of coal was reviewed and analyzed in the address of the retiring president of the American Society for Testing Materials.²

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Composition and Testing

The work of research organizations added materially to the knowledge of constitution of coal.³

The American Society for Testing Materials adopted as tentative standards the method of drop shatter test for coal and the method of tumbler test for coal; revisions of tentative standard methods of test for grindability of coal by the ball-mill and the Hardgrove-machine methods; and tentative revisions of methods of sampling coal and coke.⁴

Much work was done to determine



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the probable errors and to simplify methods of sampling coal.⁵

The increasing importance of pulverized coal is reflected in continued additions to the knowledge of grindability of coals and its effect on the performance of pulverizers.⁶



Experimental coal hydrogenation plant, Bureau of Mines, Pittsburgh, Pa.

Preparation of Coal

To enable producers to meet the growing demands of consumers for cleaned and sized coal, and to fit certain coals for markets they could not otherwise enter, studies of coal washing apparatus and methods assumed added importance.⁷ A number of the larger preparation plants and those including unusual features placed in operation during the year have been described in the literature.⁸

Treatment with oil received more detailed attention than heretofore, particularly with respect to benefits additional to elimination of dustiness, such as reduction of spontaneous heating in storage,⁹ effect on oxidation, and effect on segregation of sizes; the effect on segregation is being investigated by the Battelle Institute in a model bin. Other work at Battelle showed high viscosity oils to be the most effective in dust control.¹⁰

Results of an extensive series of tests, which showed that the addition of small quantities of chemicals does not improve the burning of coal in furnaces as had been claimed, were published by the Bureau of Mines.¹¹

A critical review, including extensive experimental work on Canadian coals, is a valuable addition to the literature on briquetting.¹²

Combustion Research and Technology

Investigation of the fundamental factors of combustion was carried on by the Coal Research Laboratory at Carnegie Institute of Technology, with the support of the industry.¹³

The market for coal for automatic househeating equipment is a tempting one to producers, and to date only 2

percent of the homes in the United States are heated with such equipment. Bituminous Coal Research, Inc., and Battelle Institute continued research on the househeating problem¹⁴ as well as on industrial stokers.¹⁵ The Iowa State College contributed a report on the use of Iowa coals in domestic stokers.¹⁶

In large public utility generating stations pulverized coal is the predominant fuel and the trend is toward larger units and higher pressure and temperature of steam.¹⁷ One 2,500-lb. unit is under construction and another is projected.

A comparatively recent development, the spreader-type stoker attracted the attention of engineers.¹⁸

Extensive contributions were made on the factors to be considered in the selection of coal for specific purposes.¹⁹

Restrictions on the emission of smoke, sulphur fumes, and fly ash, have necessitated provisions for the control of these factors in coal burning equipment. In this connection, the profitable utilization of products from the flue gases, in order to pay for their removal, has attracted attention.²⁰

The survey of gas-, coke-, and by-product making properties of American coals by the Bureau of Mines and American Gas Association had included 52 coals to the close of 1937, and is being continued.²¹ Laboratory tests related to coking properties were discussed at the annual meeting of the American Society for Testing Materials.²² For many years the possibility of making coke from Illinois coals has been attractive to producers and scientists in that State, and the Illinois Geological Survey has made an

intensive study of the problem²³ which now becomes of particular interest because coke is being made from local coal at West Frankfort. The reactivity of coke, an important consideration in its use, has been studied by a modified ignition point method at the Coal Research Laboratory.²⁴

Low-temperature coke offers an outlet for coals that are not suitable for high-temperature coking, or are not readily usable for other reasons, as for example, fine sizes and lignite. The Pittsburgh Coal Carbonization Company now has three retorts in operation. At Tacoma, Wash., development of the Coalene process, using low pressure, high temperature steam, has proceeded.²⁵ At the University of North Dakota the problem is the use of Dakota lignite.²⁶ In a review of developments in Great Britain and Germany,²⁷ it is evident that progress is slow there, as it is in this country, and that successful low-temperature carbonization awaits improved markets for low-temperature tars, or is dependent upon other peculiarly favorable circumstances.

Hydrogenation of Coal

The reliance the world has come to place on liquid fuels and lubricants derived from petroleum makes it apprehensive of the curtailment of its supplies of petroleum; this has led to an intensive and almost world-wide search for substitutes, in which scientists have naturally turned first to coal. Research and large scale developmental work on the conversion of coal to liquid fuel by hydrogenation has continued at an increased pace in a number of foreign countries.²⁸ In Germany the Fischer-Tropsch process for the synthesis of motor fuel from water gas has progressed to the point of installing several commercial plants.

In the United States the Bureau of Mines,²⁹ and Pennsylvania State College and Bituminous Coal Research, Inc., are actively engaged in exploring the possibilities of hydrogenation of American coals. During 1937 the facilities of the Bureau of Mines were greatly enlarged by the addition of the larger of the two buildings shown in the accompanying photograph of the experimental hydrogenation plant. This experimental plant supplements the Bureau's facilities for determining the amenability of American coals to the various methods of processing. Tests can now be made for carbonization, liquefaction, and gasification.

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SALES OF MECHANICAL LOADING EQUIPMENT for use in COAL MINES in 1937[†]

By { L. N. PLEIN *
R. L. ANDERSON
M. VAN SICLEN
F. G. TRYON

A DECREASE in sales of mobile loaders and an increase in sales of other types of equipment, especially conveyors, are the outstanding features of manufacturers' reports on underground loading devices for coal mines in 1937.

The total number of units shipped to the anthracite mines showed a decrease from the year before, while the number shipped to the bituminous mines showed a slight increase.

Total Units Sold.—The number of mobile loaders sold in 1937 was 297.¹ Although this was 47 machines less than the record established in 1936, it was much above the levels of the early depression years. On the other hand, the number of scrapers increased from 28 in 1936 to 30 in 1937. An increase was also reported in the number of pit-car loaders, large in terms of percent but small in actual numbers or capacity.

Conveyors again established a new record. The total number of conveyor units of all types, other than mother belts or haulage way conveyors, increased from 994 units in 1936 to 1,088 units in 1937. The figures for conveyors include both hand-loaded types and those equipped

with duckbills or other self-loading heads. The number of duckbills cannot be shown separately without disclosure of individual business, but it may be said that the record for this type of machine shows an increase, along with the hand-loaded conveyors. The total of 1,088 units also includes a number of machines sold for use in conjunction with mobile loaders and, therefore, not destined for hand-loading. A considerable part of the sales of conveyors in the last two years is

for such joint use, and the combination of the mobile machine for loading and the conveyor for initial transportation is a promising field of development.

Sales of 50 other conveyors were reported for use in haulage ways or slopes, which are not included in the 1,088 units listed above. Details are given in Table 1.

The trends of sales in recent years are shown graphically in Figure 1. The scales in this figure are so arranged as to give a rough indication of the relative importance of the several types of equipment in terms of tonnage. It will be seen that the net additions to capacity from scrapers and pit-car loaders are now small and that the recent expansion has come in the various types of mobile loaders and of conveyors with or without self-loading heads.

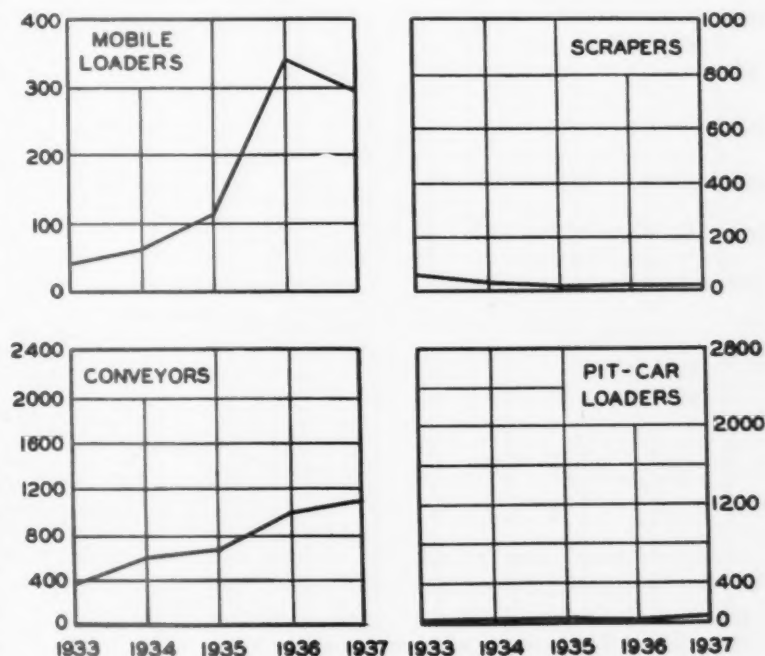


Figure 1—Number of underground loading devices sold for use of coal mines, 1933 to 1937. Figures for conveyors include those equipped with duckbills or other self-loading heads

[†] This report is made possible by the cooperative arrangement between the Bureau of Mines and the Works Progress Administration National Research Project on Reemployment Opportunities and Recent Changes in Industrial Techniques. It is published by permission of the Director of the National Research Project and the Director of the Bureau of Mines.

* Messrs. Plein, Anderson and Tryon are now members of the staff of the Market Statistics Unit, National Bituminous Coal Commission. Mr. van Siclen is chief engineer, Coal Economics Division, United States Bureau of Mines.

¹ In addition, a number of machines were exported.

Source of Information.—These figures are based upon returns courteously supplied by 29 manufacturers including all important producers of loading machinery for underground use in coal mines. The number of reporting firms is identical from year to year, although several have manufactured no equipment of this type recently, and the figures may be accepted as directly comparable.

Total Sales by States.—Shipments of mechanized loading devices of one type or another were made to 17 States in 1937. All of the larger producing States are represented in the list. In some cases, it is not possible to show the number of machines of each type sold without disclosing the business of individual manufacturers. Table 2, however, gives the total number of units shipped to each State or region during the year. The kinds of machines sold are indicated in a parallel column, the abbreviation L standing for mobile loaders, S for scrapers, P for pit-car loaders and C for all types of conveyors, including those equipped with loading heads. The several types are arranged in the rough order of their capacity. Thus, for the State of Kentucky, a total of 124 units is shown, followed by the Letters C and L, indicating that the highest capacity was in the form of conveyors, followed by mobile loaders.

Units Sold Compared With Units in Use.—The changing demand for the principal types of equipment is indicated in Table 3. The number of mobile loaders in active use as reported by mine operators increased from 488 in 1929 to 657 in 1935. Final statistics of the number in use in 1936 are not yet available.² However, the sales of 344 mobile loaders made during 1936 and 297 during 1937 were nearly equivalent to the number previously in use. The sales of conveyors in 1935 and 1936 constituted a large percent of the number previously installed as reported by the operators, especially in the bituminous fields. Because of uncertainties in definition of what constitutes a conveyor, the record of sales is not fully comparable with the record of number previously in use, but the fact of the large increase is clear.

² Transfer of the staff engaged upon bituminous coal statistics from the Bureau of Mines to the National Bituminous Coal Commission on July 1, 1937, has delayed publication of the detailed statistics of mine operation in 1936 because of the time required to obtain releases from producing companies, making available the reports previously filed by them with the Bureau of Mines for use by the Coal Commission. The 1936 records, however, are now nearly complete and final data for that year will shortly be available.

TABLE 1.—UNITS OF MECHANIZED LOADING EQUIPMENT SOLD TO ANTHRACITE AND BITUMINOUS MINES, AS REPORTED BY IDENTICAL MANUFACTURERS, 1933 TO 1937, INCLUSIVE ^a

	1933	1934	1935	1936	1937	Percent increase (+) or Decrease (—) 1937 over 1936 1937 over 1935	
Mobile loaders	41	55	115	344	297	— 13.7	+158.3
Scrapers b	65	34	22	28	30	+ 7.1	+ 36.4
Conveyors c	d396	d610	d681	d994	1,088	+ 9.5	+ 64.6
Pit-car loaders	18	26	28	11	38	+245.5	+ 35.7

^a The figures cover reports from 29 identical manufacturers. Twenty-eight identical manufacturers were canvassed in each year from 1933 to 1936, although several of these have reported no sales in recent years. One manufacturer has now indicated that he is no longer producing this type of machinery and has accordingly been dropped from the list. Since the publication of last year's report, one additional manufacturer has been heard from; his data are included for 1936 and 1937 and the number of reporting firms remains 28.

^b Reported as scrapers or scraper haulers and hoists.

^c Includes hand-loaded conveyors and those equipped with duckbills and other self-loading heads. A considerable number in 1936 and 1937 are used in conjunction with mobile loaders.

^d Revised to include reports recently received from one manufacturer of shaker conveyors not covered by preceding surveys.

The number of scrapers sold was comparatively small measured against the numbers previously employed. In the bituminous fields the number of scrapers in use reached a peak in 1930 and has since declined. In the anthracite fields, the number of scrapers continued to increase down to 1934, declining slightly in 1935 and 1936.³

The installations of pit-car loaders reached a maximum in 1931 and have since declined in both the bituminous and anthracite mines.

Regional Distribution of Mechanized Capacity.—It is well known that

the proportion of the underground output obtained by mechanical loading has been highest in the coal fields of the northern Rocky Mountains and the Middle West where high rates combined with favorable seam conditions have stimulated the process of mechanization. In the last two years, however, market conditions and the trend of wage rates have tended to stimulate mechanization in the Appa-

³ According to the Pennsylvania Department of Mines, the number of scrapers in use in the anthracite region in 1936 was 482.

TABLE 2.—TOTAL NUMBER OF UNITS OF MECHANIZED LOADING EQUIPMENT SHIPPED FOR USE IN EACH STATE OR REGION IN 1937 (L—Mobile loading machines, P—Pit-car loaders, S—Scrapers, C—Conveyors, including those with duckbills.)

	Number of units of all types shipped in 1937	Types of equipment in approximate order of capacity
BITUMINOUS		
Northern Appalachian States:		
Pennsylvania and Maryland	128	C, L
Ohio	57	L, C, P
Southern Appalachian States:		
West Virginia	381	C, L, S, P
Virginia	25	L, C, S
Kentucky	124	C, L
Alabama	76	C, S, L
Tennessee	40	C, S, L
Middle Western States:		
Illinois	113	L, C, P
Indiana	32	L, C
Trans-Mississippi States:		
Arkansas and Iowa	26	C, L
Colorado and New Mexico	69	C, S, P
Montana and Utah	40	L, C
Wyoming	66	C, L, S, P
Total bituminous	1,177	L, C, S, P
ANTHRACITE		
Pennsylvania	276	C, S
Grand total	1,453	L, C, S, P

TABLE 3.—SALES OF MECHANIZED LOADING EQUIPMENT IN 1936 AND 1937 COMPARED WITH TOTAL NUMBER OF MACHINES IN ACTIVE USE IN PRECEDING YEARS

	Number of machines in active use, as reported by mine operators							Number of machines sold as reported by 28 manu- facturers	
	1929	1930	1931	1932	1933	1934	1935	1936	1937
Bituminous mines:									
Mobile loading machines.....	488	545	583	548	523	534	657	344	297
Scrapers.....	126	150	146	128	93	119	78	19	14
Pit-car loaders.....	2,521	2,876	3,428	3,112	2,453	2,288	2,098	9	38
Conveyors equipped with duckbills, and other self-load- ing heads.....	99	140	165	159	132	157	179	†682	†828
Hand-loaded conveyors—Number of units.....	*	*	*	*	525	574	670		
Anthracite mines (Pennsylvania):									
Mobile loading machines.....	350	384	5	11	18	14	1		
Scrapers.....			457	479	455	517	507	9	16
Pit-car loaders.....			28	24	19	25	22	2	
Conveyors equipped with duckbills, and other self-load- ing heads.....	355	421	1	17	12	13	30		
Hand-loaded conveyors—Number of units.....			547	818	940	1,338	1,563	†312	†260

* Number of units not reported in these years.

† Reported as face conveyors (hand-loaded) "Shaker drives," and "duckbills." The figures of numbers sold in 1936 and 1937 are not exactly comparable with the number in use in 1935, because of uncertainties in defining what constitutes a conveyor.

lachian Region, and a large part of the sales of equipment reported by manufacturers in 1937 went to the eastern and southern fields.

Figure 2 shows in a generalized form, the regional distribution of sales in relation to pre-existing capacity. In this map the tonnage loaded me-

chanically in 1935, as reported in detail by all mine operators, is shown by the black columns. To these have been added, in white, an indication of the capacity of the equipment purchased in 1936, and also in diagonal shading, the capacity purchased in 1937. The diagram is the roughest of

approximations. It makes no allowance for the retirement of machines of obsolescent types which were active in 1935 but have since been replaced by new machinery. Also it makes no allowance for an element of double counting between certain mobile loaders and certain conveyors

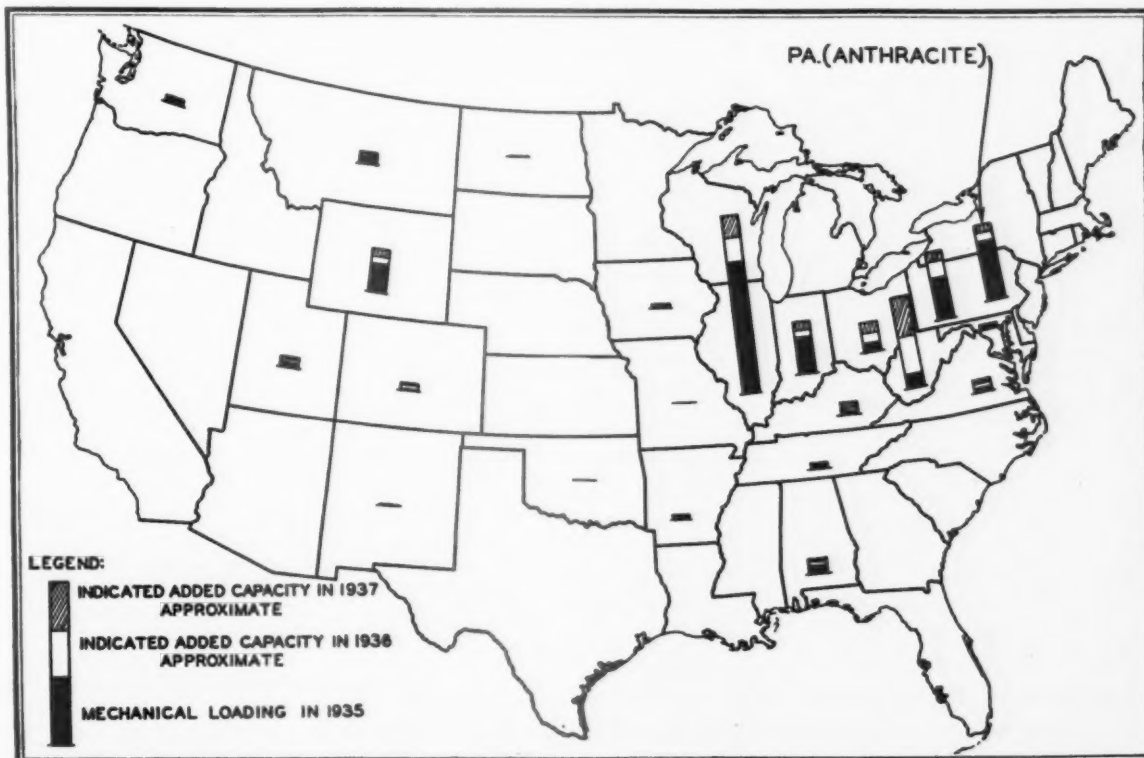


Figure 2—Tonnage mechanically loaded in 1935 and approximate capacity of new equipment shipped in 1936 and 1937

which are sold for use in conjunction. Accurate figures of the increase in actual tonnage mechanically loaded must await the publication of final statistics from the operators, which will be shortly available. In the meantime, however, the map may suffice to indicate the areas where sales of equipment have been most active.

The largest installations of mechanical loading equipment during the last two years were made in West Virginia. In that State the monthly report of the State Department of Mines gives a current record of the increase in tonnage mechanically mined. From January to November 1937, a total of 3,664,570 tons of coal was loaded on conveyors in the State and 10,572,634 tons were produced by mobile loaders, scrapers and other devices, eliminating hand shovelling. The total loaded with the aid of the mechanical devices was thus 14,237,204 tons for the 11 months period, indicating that the year as a whole may show a figure as high as 15,500,000 tons. In 1935 the total for the State as reported by the U. S. Bureau of Mines was 2,059,322 tons. West Virginia's rise in mobile loading during the last three years has thus been rapid but it should be remembered that only 14 percent of the State output is as yet produced by mechanical loading while 86 percent is still shovelled by hand into mine cars.

Loading machinery is also being introduced into Kentucky, both East and West.

Loader and Scraper Sales by Regions.—It is not possible to show the sales of each type of equipment in every State without disclosing the business of individual manufacturers, but Table 4 gives the sales of mobile loaders and scrapers in the larger States or regions. In 1937 manufacturers reported selling 21 mobile loaders of all types to operators in Illinois. These sales may be compared with a total of 319 machines of similar type in active use in the same State during 1935. Some part of the sales of mobile loaders in this State and in Indiana undoubtedly represent replacement of pit-car loaders.

The largest number of mobile loaders sold in any State in 1937 went to West Virginia. Other areas to which substantial shipments of mobile type machines were made include Western Pennsylvania, Ohio and Kentucky. Sales in smaller volume went to seven other States. Sales of scrapers were

TABLE 4.—COMPARISON OF MOBILE LOADERS AND SCRAPERS IN ACTUAL USE IN 1935 WITH SALES REPORTED IN 1936 AND 1937 BY REGIONS

	Mobile loaders			Scrapers		
	In use in 1935	Sales in 1936	Sales in 1937	In use in 1935	Sales in 1936	Sales in 1937
BITUMINOUS						
Northern Appalachian States:						
Pennsylvania—Maryland	41	66	23	19	2	..
Ohio	27	22	22	..	..	..
Southern Appalachian States:						
West Virginia	38	105	84	3	1	5
Virginia	1	5	8	..	4	1
Alabama	4	9	7	20	5	5
Kentucky	2	5	18	2	..	..
Tennessee	2	..	1	2	1	1
Middle Western States:						
Illinois	319	95	81	..	..	..
Indiana	123	22	31	..	..	..
Trans-Mississippi States:						
Arkansas, Colorado, Montana, New Mexico, Utah and Wyoming	100	15	22	32	6	2
Total bituminous	657	344	297	78	19	14
ANTHRACITE						
Pennsylvania	1	..	..	507	9	16
Grand total	658	344	297	585	28	30

TABLE 5.—COMPARISON OF CONVEYORS IN ACTUAL USE IN 1935 WITH SALES REPORTED IN 1936 AND 1937, BY REGIONS * (Includes hand-loaded conveyors and conveyors equipped with duckbills or other self-loading heads.)

	Conveyors in use in 1935 *	Sales of conveyors in 1936	Sales of conveyors in 1937
BITUMINOUS			
Northern Appalachian States:			
Pennsylvania	347	77	105
Ohio	..	49	34
Southern Appalachian States:			
West Virginia	71	239	271
Virginia	44	32	16
Kentucky	15	36	106
Alabama and Tennessee	78	55	102
Middle Western States:			
Illinois and Indiana	12	18	19
Trans-Mississippi States:			
Arkansas, Colorado, Iowa, Missouri, Montana, Oklahoma, Utah, Washington, and Wyoming	282	176	175
Total bituminous	849	682	828
ANTHRACITE			
Pennsylvania	1,593	312	260
Grand total	2,442	994	1,088

* The figures of number in use in 1935 are not exactly comparable with the number sold in 1936 and 1937 because of uncertainties in defining what constitutes a conveyor. The comparison, however, will serve to indicate which regions have made the largest proportionate increases.

consigned largely to areas of special seam conditions where this type of equipment offers particular advantages.

Conveyor Sales by Regions.—Table 5 shows the geographical distribution of sales of conveyors as far as they can be given without disclosing individual business. Manufacturers reported shipments of 828 units to the bituminous coal fields extending from Pennsylvania south to Alabama and

from Virginia westward to Washington. In all, conveyors were sold in 15 States. The largest number sold in any state of the bituminous fields went to West Virginia, particularly to the southern portion.

The largest single market for conveyors remained the Pennsylvania anthracite region to which sales of 260 conveyor units were reported in 1937 as against 312 in 1936. Most of these were shaker chutes of various types.

INDUSTRIAL MINERALS†

• Important Strides Made in Technology of Treatment and Use

SALES of nonmetallic minerals and their primary products attained a value of about \$790,000,000 in 1936 but, large as this figure is, mere money value may measure quite inadequately their industrial importance because some of them are regarded as absolutely essential to modern industry. Asbestos as a material for automobile brakeband linings, mica as a component of electrical equipment, and limestone as a metallurgical fluxing agent are striking examples of indispensable minerals. Nonmetallic minerals are today of inestimable importance to the industrial and economic life of the country.

In early days, the great group of industries producing these materials utilized crude methods of mining and preparation, but within the past 25 years constantly accelerating progress is apparent in research and resulting technical improvement. Methods of beneficiation long known in the metallic mineral industries have been applied to nonmetals so assiduously that in some fields of application the pupil is attaining the role of teacher.

So much has transpired in 1937 that in the limited space available reference can be made only to the most outstanding accomplishments.

Where mere selection of the purest available nonmetallic mineral deposits provided acceptable supplies in past years, today it fails in many instances to furnish satisfactory materials, partly because the cream has been skimmed from many deposits and partly because the requirements of users are becoming more and more rigid; beneficiation has therefore become a necessity.

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Advances in Wet and Dry Concentration

Well-known methods of wet treatment, such as froth flotation, and agglomeration and tabling are applied increasingly. The former process is now used commercially on cement raw materials, phosphates, fluorspar, clay, talc, halite and sylvite. About 30 basic minerals are now separable by anion or soapy wetting agents, and the Bureau of Mines is developing processes for separating silicate minerals by the use of cationic filming agents (those applicable to acidic minerals). Commercial separation of quartz and feldspar by such agents is expected early in 1938. Agglomerate tabling has been applied successfully to phosphate rock, cement raw materials, and kyanite.

Dry methods of concentration, including selective air separation, dry tabling, and magnetic and electrostatic treatment, are making rapid progress. A new electrostatic separator pins the mineral grains to a grounded rotor. The particles that lose their surface charge most rapidly are removed by a gas-filled electrode, while the others are carried on the rotor until removed with a brush.

Grain Size of Powders Important

A recent development that affects quite a number of industrial minerals is a recognition of the importance of grain size of impalpable powders and,



OLIVER BOWLES

therefore, the inadequacy of a mere determination of screen residues. The covering power of mineral pigments, the rate of setting of portland cement, and various other phenomena are now known to be influenced greatly by the degree of fineness of materials far smaller than the meshes of the finest sieve. This has led to the growth of a new technique, the measurement of grains of sub-sieve sizes. Elutriation, sedimentation, hydrometer or microscopic methods may be used, but the quickest and most practical method is determination of specific surface, that is, the surface area of the particles in square centimeters per gram. Specific surface is measured with a turbidimeter, an instrument that determines the degree of opacity of a liquid suspension of the pulverized material. Specifications as to fineness are now being written on the basis of specific surface rather than screen test.

The portland cement industry has experienced remarkable changes in equipment, methods, and specifications. Fineness of cement is attracting much attention, and there is a sentiment toward setting a maximum as well as a minimum limit. The turbidimeter affords such a ready means of measuring fineness in terms of specific surface that there has been a sudden urge to specify narrow limits within which

the surface area must fall. To forestall a rigidity of fineness specifications that might work a hardship on producers, the A. S. T. M. has issued a revised specification for portland cement in which no reference is made to fineness. This omission is justified first by the fact that all cement is now ground to a degree of fineness far beyond specifications heretofore established, and second because the strength, volume change and other properties are influenced by fineness and, therefore, with adequate limits for these properties, the requisite fineness will be obtained automatically.

Clay Processing

Methods of processing high-grade clays have been so perfected that domestic clays are rapidly replacing those of foreign origin. The T. V. A. laboratories at Norris, Tenn., working in cooperation with the Bureau of Mines, are developing methods of taking clays apart, separating harmful impurities, and putting them together again in such combinations of clay minerals as will give porcelain clays and other special types now largely imported. The Harris Clay Co., Lunday, N. C., has recently erected a mill equipped with the most modern types of rake classifiers, hydroseparators, thickeners and magnetic filters, whereas some of the older plants have only crude sand wheels and settling troughs. Other improvements in clay working include introduction of the "dry-mix-

ing" process, fractionation of clays into groups on the basis of uniformity of particle size, and use of high-temperature electric kilns.

Phosphorus from Phosphate Rock

Smelting phosphate rock for production of elemental phosphorus, a process promoted actively by the Department of Agriculture and the T.V.A., has now attained commercial importance. The Phosphate Mining Co. began production of elemental phosphorus with its new electric furnace at Nichols, Fla., in 1937, and the Monsanto Co. of St. Louis, Mo., has recently completed a large plant for making this product near Columbia, Maury County, Tenn. So noteworthy is the process perfected by the latter company that the 1937 Chemical and Metallurgical Engineering award for outstanding chemical engineering achievement was bestowed upon it.

Insulating materials that perform the dual office of protection against the cold of winter and the heat of summer are regarded as essential adjuncts of modern construction. The most important are rock wool, slag wool and glass wool, the production of which has grown apace. Sixty or more widely scattered plants are operating, and new ones are recorded at frequent intervals. Vermiculite and other lightweight products are used similarly.

Carbon Dioxide from Lime Kilns

Enormous quantities of CO₂, approximately 4,200 tons daily in the United States, are discharged from lime kilns, and although utilization thereof has long been discussed, very few plants are equipped for its recovery, chiefly because the gas is quite impure. By the Gillette process, developed a few years ago, limestone is calcined so that the relatively pure CO₂ from the stone is not contaminated with the fuel gases. A lime plant built recently in Australia has CO₂ recovery equipment designed on an entirely different principle. The kiln gases, no matter how impure, are passed through absorption towers, where they come in contact with a solution of potassium carbonate with which the CO₂ unites to form potassium bicarbonate. When the latter is heated to 80° C. it decomposes, setting the CO₂ free, and the potassium carbonate is returned to the towers for another cycle. The present extensive use of solid CO₂ encourages more active steps toward recovery from lime kilns in the United States.

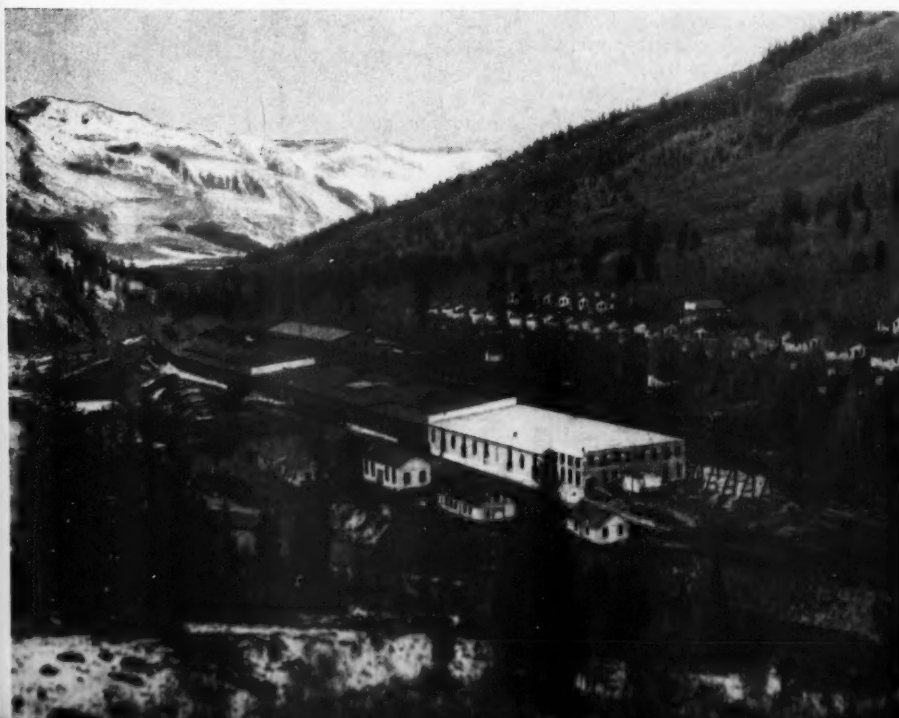
The Belle Isle Lime Co., Detroit, Mich., is operating a limestone preheater that increases fuel efficiency very greatly. The ordinary rotary lime kiln utilizes the heat of the gases from about 2500° F. to about 1250° F.; thus about one-half of the heat goes up the stack. The new preheater not only recovers about 70 percent of the heat in the waste gases but adds greatly to kiln output because almost the entire length of the rotary kiln becomes a calcining zone.

A record output of 75 tons of lime a day from a single gas kiln has been attained by the Peerless White Lime Co., St. Genevieve, Mo. The kiln has a patented center burner at one level and a set of external burners at a higher level.

New Gypsum Cement Important

Manufacture of a new hydraulic gypsum cement having extraordinary possibilities has reached the pilot-plant stage. The process (Patent 2090625, dated August 24, 1937) based on about 8 years of research, consists briefly of calcining at a temperature ranging from 1800° to 2300° F. gypsum to which has been added about 2 percent of phosphoric acid and sodium phosphate and about 3 percent of silica or silicates. The resulting product is said to be weather resistant, to have good working qualities, to be quick setting, and to develop far greater strength than any gypsum

A marble finishing mill at Marble, Colorado





Arlington Memorial Bridge, Washington, D. C. Bridge is Mt. Airy, N. C., granite, and Lincoln Memorial is Colorado marble

cement made heretofore. When commercial production begins, the quality and endurance of this new material in floor construction, as wall plaster, and for many applications where portland cement is now used, will be watched with interest.

Wire saws introduced by the Bureau of Mines in the slate district of Pennsylvania about 10 years ago are being used more extensively in the famous building-limestone area adjacent to Bedford and Bloomington, Ind., to cut massive blocks from their native beds. During 1937, one company equipped

its quarry to operate three saws.

Fluorspar production, which is of interest to steel manufacturers, has received added impetus with the discovery about two years ago of a large, new high-grade vein in the Daisy mine of the Rosiclare Lead & Fluorspar Mining Co. and the discovery of more extensive deposits in the Cave-in-Rock, Ill., area.

Of interest to petroleum producers is the completion of a new fuller's earth plant at Paris, Tenn., and the utilization of two new bleaching earths, namely, a low-grade bauxite

high in iron from Eufaula, Ala., and a glacial clay from Harrietta, Wexford County, Mich.

Other items that could be enlarged upon are improvements in methods of test and specifications for aggregates, changes in detonators and explosives that promote safety in blasting, a wider use of translucent marble for decorative lighting, an increasing demand for olivine as a furnace refractory and for talc as a constituent of ceramic bodies, and the use of molten sulphur as a circulating fluid or weighting material in oil-well drilling.

SAFETY IN MINING†

• *Recession in Safety in Mining, Particularly in the Coal Industry, Featured the Year*

DEFINITE figures are not yet available on most of the phases of accident occurrence in mining in 1937, but the information at hand indicates that in addition to the business "recession" there was a somewhat similar "recession" in safety in mining in the United States, especially in coal min-

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ing. Tentatively month-by-month figures furnished to the Bureau of Mines by the various States on fatalities in coal mines indicated that up to October 1 there was a possibility that

the year 1937 would have a better or lower fatality rate than 1936 which had the lowest rate on record (2.72 persons killed per 1,000,000 tons of coal produced). However, October, November, and December were definitely unfavorable months in coal-mine safety, and, as a result, the 1937 coal-mine fatality rate is tentatively placed at 2.98 persons killed per 1,000,000 tons of coal produced, or higher than in any year since 1932 when the rate was 3.36; however, the rate of 2.98 is lower than was ever achieved prior to 1933 even though higher than in 1933, 1934, 1935, and 1936.

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D. HARRINGTON

Tentative figures indicate that about 1,245 persons were killed in the production of approximately 442,000,000 tons of bituminous coal with a rate of 2.82 fatalities per 1,000,000 tons (the tentative rate being 2.50 in 1936); 222 persons are listed as having been killed in the production of about 50,000,000 tons of anthracite coal or a tentative fatality rate of 4.44 (the tentative rate in 1936 being 4.46). The total fatalities in coal mining for 1937 are given (tentatively) as 1,467 compared with 1,330 in 1936, and the total (tentative) rate in 1937 is given as 2.98 compared with 2.72 (also tentative) in 1936. The 1936 rate is the lowest in the recorded history of coal mining in the United States.

Six major explosion disasters caused a total of 101 deaths in 1937 (as many deaths as such disasters caused from 1933 to 1936, inclusive). This trend is by no means reassuring. Moreover, it now develops that although the increase in fatalities from explosions was the heaviest blow to coal-mine safety in 1937, there were also increases in the fatality rate from falls of roof and coal, haulage, explosives, electricity, machinery, shaft accidents, and surface accidents, indicating a fairly general *let down* "all along the line" in accident-prevention work in coal mining compared with 1936.

Figure 1 shows the recent upward trend in occurrence of fatalities in bituminous-coal mines; the figures for 1936 and 1937 are tentative. The graph also shows the progress that had been made in the reduction of fatalities in bituminous-coal mines starting definitely in 1931 and reaching an all-time low in 1933. The fatality record of bituminous coal mining in the United States in 1933 was an all-time

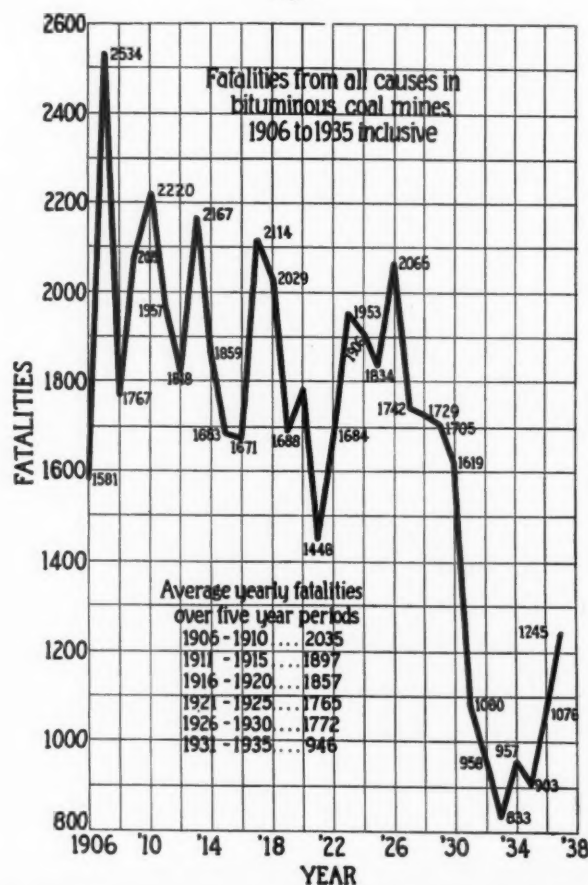
low as to number of fatalities and also as to rate of their occurrence up to that date.

Data as to accidents in noncoal mines are fragmentary, and while only one major disaster with six fatalities is known to have occurred available information indicates that, as in coal mines, the rate of occurrence shows an upward trend and disquieting conditions are present. Figure 2 shows a remarkable decrease in fatalities in metal and nonmetallic-mineral mines to an all-time low in 1933 but a definite upward trend since 1933; while definite facts are not available for 1936 or 1937, unquestionably the figures as to accident occurrence in metal and nonmetallic-mineral mines in the United States for 1935 will be found to have been exceeded in both 1936 and 1937.

On November 24 the portland-cement industry celebrated the twenty-fifth anniversary of its safety movement, and it was announced that in the quarter of a century during which intensive safety activities have been in effect in that industry (which now involves about 50,000 persons) in-

juries have been reduced about "95 percent to a point where only one cement man in more than one hundred is hurt at work." It was also stated that "organized safety work has saved 2,610 lives and averted 21,700 serious injuries in 25 years." In the approximately 15 years that the Portland Cement Association has been giving a trophy to cement plants which operate an entire calendar year without a disabling injury, trophies have been won by 118 cement mills—many of them repeatedly—and "a grand total of 351 plant years have been run up without a single disabling injury." The Iola (Kans.) cement plant has operated from September 9, 1926 to January 1, 1938 (or more than 11 years) without a lost-time injury, and the record, still in effect on January 1, 1938, covers 3,252,490 man-hours of exposure. In the cement industry, as in other industries, accident occurrence has increased during the past few years, especially in 1934, 1935, and 1936, and it is probable that the 1937 record has not been much, if any, more favorable than that of 1936. However, the cement industry has

Fig. 1



laid a firm foundation in safety, and unquestionably the trend of accident occurrence will again start downward, probably in 1938.

The year 1937 witnessed numerous changes in State laws affecting the mining and allied industries, chiefly in connection with compensation as to safety or health, or both. Many of the States increased the benefits accorded injured employees; several adopted occupational disease laws, chiefly in connection with dust inhalation; and several States revised the law or regulations as to safety. In most instances the intent was to increase benefits to the worker, but in some instances the wording of the newer regulations or laws is such that the application of the changes will be detrimental to health or safety, or both. Several States have committees or commissions engaged in assembling information for possible use in the framing of new legislation (chiefly some phase of occupational disease), and numerous changes in State health and safety laws and regulations may be expected in the next few years. Numerous unofficial organizations also are investigating various phases of health and safety (particularly as to the effects of dust or dusts), and much

progress is being made in the prevention of air dustiness in mines and tunnels, although many mines still persist in the use of dust-producing methods or equipment, of which the most hazardous is dry drilling in rock.

Safety and health in mining made some progress in 1937, even though there was a "recession" in occurrence of accidents. Fundamentally the mining industry is on much firmer ground as to the advancement of

health and safety at the end of 1937 than the relatively poor accident record of the year would indicate. The numerous changes made and contemplated in connection with mine health and safety in 1937 had a definitely disturbing effect on safety performance, but it is confidently hoped that safety performance in 1938 by the mines of the United States will exceed that of any previous year, including the banner year 1936.

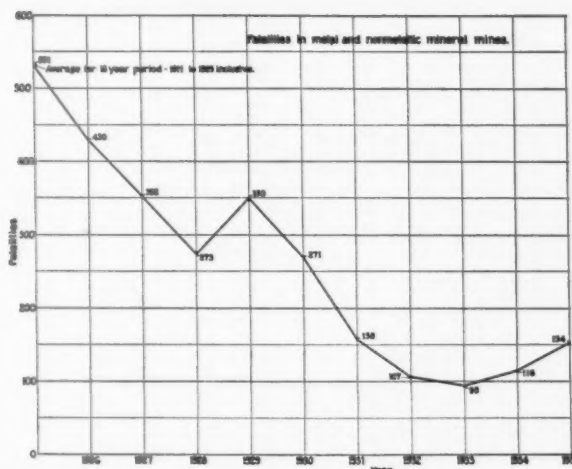


Fig. 2

Review of the INTERNATIONAL SITUATION[†]

• *Economic Nationalism Still the Dominant Theme in Many Countries*

FOREIGN trade statistics of the major industrial countries, available for the greater part of 1937, indicate that world production and apparent consumption of most minerals during the year reached an unprecedented high level.

With reference to those basic mineral raw materials that are essential to modern industry, such as coal, iron ore, pig iron, manganese ore, bauxite,

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refined copper, pig lead, slab zinc, pig tin, and petroleum products, there are eight countries (Belgium, France, Germany, Italy, Japan, U. S. S. R. (Russia), United Kingdom, and the United States) that collectively consume more than 75 percent of annual

world output and also produce, with a few exceptions such as tin, lead, zinc, and copper, more than 50 percent of total world output.

Significant factors in the international situation during 1937 are not evident in a mere statistical analysis of mineral production and trade. Such a review simply indicates a decided improvement in world demand. Practices which in normal periods were not applied and at present are exercised by only a small number of countries experiencing monetary complications, have resulted in the adoption of regulations and restrictions governing production, consumption, and foreign trade in mineral raw materials. These measures have been in

roduced primarily to influence favorable trade balances. There are a few basic minerals and metals so essential in the economic development of industrial nations that a lack of domestic reserves affects materially the entire structure of a country. In this category fall coal, petroleum products, iron ore, pig iron, and to a somewhat smaller degree a few nonferrous metals. The inability of certain consumer nations to pay for imports of essential raw materials, and consequent establishment of exchange control systems, are factors closely linked to the existing problem of production and consumption control measures, as well as discriminatory foreign trade regulations which now influence world trade.

Lack of adequate mineral resources is a fundamental problem in programs to achieve national economic self-sufficiency, the expressed objective of several industrial countries, notably Germany, Italy, and Japan.

Shifts in German Trade

German foreign trade policy, as reflected by the "New Plan" or "Four-Year Plan" inaugurated in September, 1934, has two basic elements—the purchase abroad of no more than can be paid for out of foreign exchange proceeds of German exports, and regulation of German imports to meet national requirements. Several results are evident at the end of 3 years, but with respect to German foreign trade in minerals, the most important feature is a considerable shifting in the importance or rank of sources of supply.

The commercial policy adopted by Germany has had a material effect on foreign trade with the United States, as indicated, for example, by the decline in exports of refined copper from the United States to Germany. During the 3-year period 1927-29, 89 percent of Germany's consumption of copper was imported and 58 percent of the imports originated in the United States; during the 3-year period, 1934-36, 75 percent of Germany's copper consumption was imported, but only 16 percent originated in the United States; during the first 10 months of 1937, 140,681 metric tons of copper were imported by Germany, of which 14 percent originated in the United States.

While this copper, in its entirety, did not actually originate in the United States since the greater portion of it was imported in the form of

blister or other unrefined copper and processed for export, nevertheless this decline in imports from the United States reflects the movement toward other sources where Germany has found a more substantial market for its manufactured products. For example, imports of copper into Germany from Finland, Yugoslavia, Sweden, Rhodesia, and the Belgian Congo have increased considerably in the past 3 years and the total tonnage imported from these sources more than offsets the loss sustained by the United States. Germany's determination to force a realization of the "Four-Year Plan," involving a maximum raw material production and decreasing the dependence on imports, is reflected in the formation, during 1937, of a state-owned company for the exploitation of low-grade iron ore deposits scattered throughout the country in which private capital has apparently shown no interest. The prevailing shortage of commercial-grade iron ores prompted German authorities early in 1937 to introduce a system of apportioning available supplies and restricting consumption for certain purposes. It is reported that these measures created confusion and dissatisfaction in the steel producing and consuming branches of the industry and the evident unsatisfactory results of this official control forced the government to conclude that the only available remedy is the development of domestic sources by subsidized exploitation of hitherto uneconomic low-grade ore deposits.

While Germany's shortage of mineral raw materials includes a variety of products, such as copper and its alloys, tin, zinc, nickel, chrome, bauxite, etc., probably the most serious problem confronting Germany involves a steady and adequate supply of high-grade iron ore to meet current demands of its iron and steel industry, which in turn represents the principal prop under the entire German industrial structure.

Italy Pushing Coal and Iron Output

Italy's lack, from domestic or colonial sources, of adequate reserves

of coal, tin, petroleum, manganese, iron ore, and copper may be compared with Germany's dependence on foreign sources for a greater portion of its requirements of bauxite, copper, iron ore, manganese, tin, and petroleum. Italy's objective, as expressed officially in March, 1937, is to develop the coal deposits of Istria and Sardinia to a

point where output from these sources will represent one-third of total annual consumption, estimated at 10 to 12 million tons. If this objective is ultimately reached, two-thirds of Italy's requirements still must be imported. Italy's iron ore reserves may possibly provide its requirements but to date this is not the case. Although iron ore production is increasing annually. Italy imported during the first nine months of 1937



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more scrap iron than during the entire preceding year.

This dependence on foreign sources for a large portion of their mineral requirements has been used by Germany and Italy, and to some extent by other industrial nations, as a bargaining measure in their trade negotiations with other countries.

Economic nationalism or self-sufficiency, as these terms may be applied to mineral raw materials, cannot be achieved under present conditions by Germany, Italy, Japan, or any other nation through legislative enactments, substitution of synthetics, restriction on uses, or exploitation of uneconomic deposits.

Foreign trade statistics for 1937 indicate that Germany's imports of bauxite, on which its aluminum industry depends, increased, compared with 1936, more than 5 percent; imports of refined copper increased more than 11 percent; imports of both iron ore and pig iron approximated those of 1936, while imports of scrap iron and steel apparently were about 30 percent greater than the preceding year; imports of manganese ore about doubled the tonnage imported during 1936; and imports of crude petroleum advanced 10 percent. This increase in imports of essential raw materials may be evident in other lines but those specified are commodities, the imports of which, according to the "Four-Year Plan" inaugurated in 1934, were

to be drastically reduced and substitutions from domestic sources were to preclude necessity of large-scale importations of these raw materials.

Statistics for Italy, covering the first nine months of 1937, indicate a decided increase in the annual imports of crude petroleum, coal, iron ore, and scrap iron and steel. Imports of refined copper approximate the tonnage imported in 1936.

Figures available for the first seven months of 1937 indicate that Japan's imports of refined copper will show a material increase compared with 1936. The annual imports of iron ore may only approximate the tonnage imported in 1936, but imports of scrap iron and steel for the first seven months of 1937 were 1,355,546 metric tons compared with 1,497,043 tons for the entire year 1936, and an increase of 143 percent compared with the imports of scrap in 1932. The United States is the principal source from which Japan purchases its scrap iron and steel, accounting for approximately 80 percent of the total tonnage imported by Japan during the first seven months of 1937.

Effects of Such Measures on United States

What has been the effect on the United States of the industrial and foreign trade control measures adopted by certain countries, especially Germany, and those of a less restrictive type by other nations, and what is this country doing to cope with the situation?

Of major significance is the fact that several countries, Germany in particular, have utilized their positions as outstanding buyers and importers of essential minerals to develop their export sales of semifinished and finished products. The operation of Government exchange control boards has deprived individual consumers of im-

ported raw materials of the opportunity to purchase their requirements in competitive markets at world prices; the prospective seller, that is, country of origin, is determined by these control boards, and the cost factor in many cases is of secondary importance in these transactions.

This situation has resulted in numerous trade agreements, for example, between Germany on one side and several southeastern European and Latin American countries on the other. The latter can furnish essential minerals for German consumption, and, as these countries are not highly industrialized, they normally import a large percentage of their requirements of semifabricates and manufactured products. Many trade agreements have been negotiated by Germany predicated on "must-purchase" conditions, and these have had the effect of placing American exporters of manufactured products at a decided disadvantage in the foreign markets involved. It represents a form of discrimination that American firms individually or collectively are unable to correct.

Trade Agreements Program

The policy of special trade preferences, adopted by so many countries during the past 3 years, has led to uneconomic and sudden shiftings of the normal channels of trade and to a demoralization of price structures. To cope with this situation and to expand and safeguard its foreign trade, the United States has adopted a liberalizing commercial policy, the foundation of which is set forth in the Trade Agreements Act of June 12, 1934, an amendment to the Tariff Act of 1930, which was extended for 3 years by the Joint Resolution approved March 1, 1937. To attain the desired objectives, this act permits reduction in United

States import duties to a maximum of 50 percent of existing rates in return for tariff reduction and modification or elimination of other trade barriers to products of United States origin. To eliminate and prevent trade discriminations against products of United States origin, the act permits withholding the benefits of concessions granted to a country with which a trade agreement has been concluded, from a third country that is found to discriminate against the United States in its trade relations. Of note is the fact that this provision of the act is applied at present only to Germany and Australia. All trade agreements (except the special Cuban agreement) negotiated under this act carry the unconditional most-favored-nation clause, and the benefits of trade-agreement concessions are extended not only to all countries entitled to such equal treatment because of established commercial agreements, but also to other countries which in fact accord equal treatment to products of United States origin. By the end of 1937, reciprocal trade agreements were in effect under this act with 16 countries.

Concessions have been made by the United States in the form of tariff reductions on some mineral products, such as manganese and zirconium ores in the Brazilian agreement, silica and portland cement in the Belgian agreement, granite in the Swedish agreement, and feldspar, limestone not suitable for building purposes, talc and soapstone in the Canadian agreement. However, reciprocal concessions have been granted the United States on numerous semifabricates and manufactures of mineral origin which in pre-depression days constituted important items in the export trade of this country, particularly in the petroleum products group and iron and steel products group.

Application of the Securities Act to the Mining Industry†

• Explanation of Objectives of Act and New Form Used for Mining

AS WAS so clearly stated by the Chairman of the Commission in his address to you last year,* the Commission is fully aware of the great importance to American business life of the mining industry of the country, and of the necessity that the proper financing of that industry be not unduly impeded.

Undoubtedly, your chief interest in regard to the work of the Commission lies in the incidence of its work upon the issuance of securities of mining companies. The speech of Mr. Landis last year clearly explained the basic policy of the Commission in regard to that class of securities. In consequence, I shall not attempt to restate that general policy but beg leave to refer you to that address.

Since the time of that speech, however, a new form for the registration of mining securities has been adopted by the Commission, and it seemed to me that it might be mutually profitable for us to discuss in some detail the requirements contained in that form.

In order, however, to give a general picture of the present requirements of the Act and the rules of the Commission, I should like to recall that there are at present rules exempting from registration securities the offering of which amounts to less than \$100,000. The conditions by which such exemption is obtained are simple and easily applicable. The requirements which we shall presently discuss, therefore, have relationship only to larger issues. This must be borne in mind in any consideration of the incidence of these requirements upon the mining industry in general. You will doubtless recall that consideration was at one time given to a proposal to modify

the above exemption rules in the sense of imposing only the condition that the State laws in which the securities are to be offered be complied with, in order to entitle an applicant to the exemption. Since that time, however, it has been decided to preserve basically the present exemption rules. Experience has shown, nevertheless, that those exemption rules need some change and amendment. Study as to the nature and extent of those modifications is presently under course. I shall not, therefore, attempt to discuss those exemption rules at the present moment.

Before undertaking to discuss the requirements for registration under the Securities Act, I should like to say a few general words concerning the statute and its general administration.

Basic Objective

As you recall, the Securities Act was adopted for the purpose of regulating the interstate traffic in securities. Experience had demonstrated the necessity for such regulation. The loss by the American public in securities offered through interstate channels of commerce was so great that it can fairly be said that industry was losing a large part of its life blood, namely, capital. Capital was being drained in part from its proper use—the building of factories and the exploiting of natural resources—to the hands of persons who were interested solely in profits made upon the creation and flotation of securities.

Few, if any, persons now criticize the basic objectives of the statute. It

is realized that the inconvenience that may be suffered by the honest man is more than outweighed by the conservation of his raw material, capital.

It cannot too often be recalled also—since there has been a general misapprehension in this regard—that the Securities Act is not a Blue Sky one. In other words, in order for a security to be registered no approval of the merits of the security is requisite. In point of fact, registry does not import either quality or pedigree. In order that securities may be registered it is solely necessary that a full and frank disclosure be made of the facts by which an investor can make a judgment as to the investment value of the security. It is the clear duty of the Commission to see that such a disclosure is made.

Some people have been under the impression that securities of new mining companies are not looked upon with favor by the Commission as being *speculative*. I would like to disabuse you of that idea, if you have it. As above stated, the Commission is not empowered to pass upon the merits of securities. If it should attempt to thwart the issuance of speculative securities it would be committing an abuse of authority. Indeed, all investment is *speculative*, there being only differences of degree. There is yet to be discovered a place where your money can be put and where you can be sure it will be there when you go to get it. All that registration requires, in the case of speculative securities, is that the terms of the gamble be fully disclosed. It does not impose requirements as to the nature of the

* "Mine Financing as Viewed by Securities and Exchange Commission," by James M. Landis, *The Mining Congress Journal*, December, 1936, pp. 11-13.

† Presented to Metal Mining Convention, Western Division, The American Mining Congress, Salt Lake City, Utah, September 8, 1937.

odds. I think you will agree with me, however, that the Commission by its rules should attempt to require a clear disclosure of the terms of the chances. In point of fact, if such were not obtained the Commission would fail in its duty.

It is in view of the task so imposed upon the Commission to obtain full and frank disclosure of the pertinent facts that I would ask you to consider the requirements for registration.

Form A-O-1 Described

I shall address myself particularly to Form A-O-1 as being that which particularly interests you. This was the form which was adopted last year and which expresses the policy of the Commission as to what should be furnished by a new mining company seeking a relatively large amount of capital from the public.

Before detailed discussion, I should like to present to you some of the general problems presented to the Commission in the preparation of such a form. In so doing, I think I will make clear to you the reason for some of the provisions which otherwise might not be apparent.

In the first place, the form is to be used by all new mining ventures, wherever they may exist. There are registered with the Commission securities for mining ventures in Canada, in the various States of the West, in Mexico, in South America, and in the various states of the East. The practices of setting up securities and organizing companies in these different localities are quite different. It is necessary, therefore, that the form be directed not only to the practices of a single locality, but to all of them. In consequence, the difficulty of the form for any one registrant is not to be judged by its word length, since quite a number of its provisions will be inapplicable to the particular registrant, as directed to modes of business or corporate structure existing in other localities.

Terminology a Source of Difficulty

It must also be borne in mind by those seeking to make a judgment as to the incidence of the requirements, that the securities are generally being offered in a community or communities far distant from that in which they take their creation. Securities of a Colorado corporation may be offered to investors in Pennsylvania. The language and terminology used must be comprehensible both to the pro-

moter of the corporation and to the investor for whom the information is obtained. Unfortunately our financial language has not had too precise a usage, so that some financial terms have varying meanings in different parts of the country and in different industries. I mention this matter because terminology has been one of the sources of difficulty in the Commission's work. Some people have not understood what was required. On the same account any new form, such as A-O-1, during its period of introduction, must bring about a certain amount of difficulty until its language has become fully understood. To obviate as many of these difficulties as possible, certain basic terms have been defined. The unavoidable misapprehension, above described, although annoying and vexing to the registrants at the beginning, will certainly soon

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Editor's Note—Such importance was attached to the subject of "The Application of the Securities Act to the Mining Industry" that an entire afternoon was devoted to its presentation and discussion at the Metal Mining Convention of the Western Division, American Mining Congress, at Salt Lake City, September 8. Interesting discussion of the subject by Messrs. H. B. Fernald, D. A. Callahan, Bliss Moore, R. S. Palmer and Carl Trauerman will appear in the March Journal.

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vanish as more experience is gained and better study of the requirements has been made. As the Germans say, "All beginning is difficult."

To make the requirements as precise as possible, the form is accompanied by an instruction book. The purpose of this instruction book is to act as a manual in the preparation of the statement. For example, there are set forth definitions of basic terms such as "proven ore" and "promoter," so that the difficulties which exist in regard to those terms may be obviated as far as possible. Unfortunately, in the filings which had been made, these instructions sometimes have been overlooked, or not carefully examined.

I shall now briefly discuss the major contents of the form.

After several general questions asking for the state and date of incorpo-

ration, date of termination of the charter, name of any person controlling the corporation, and a statement in general terms of the character of the business of the registrant, there are a series of items relating to the promotion of the registrant.

Promoter Defined

Before discussing these items, I should like to direct your attention to the definition of "promoter" contained in the instruction book. This definition is as follows:

"(a) Any person or persons taking initiative in founding and organizing the enterprise.

"(b) Any person who in consideration of services has received or is to receive 10 percent or more of any class of securities of the registrant.

"(c) Any person who in consideration of property has received or is to receive 10 percent or more of any class of securities of the registrant, unless such person has not taken a significant part in founding and organizing the enterprise.

"(d) Any person for whom any promoter is acting in representative capacity with respect to the registrant."

After considerable consultation this definition of "promoter" was adopted as being the one most consonant with general usage and the purposes of the form. Some persons, however, have been accustomed to use the term with a different connotation. In consequence, they have been led to misunderstand the exact requirements.

Last fall I had quite a long discussion with quite a number of people concerning this very word "promoter." Upon returning to Washington we made a further study of this particular term, and found that, as I thought before, there was the greatest variance in the usage of the term, and I mention it because we must have definitions—terms must have meanings—and since these securities are being offered over the whole country we must seek for a certain universality of meaning; for instance, if it has a different meaning in the West than in the East it is necessary, of course, to have some definiteness to the term. As I said before, unfortunately some people have not carefully studied this definition, which has caused a misunderstanding of the requirements. Of course this form that I mention is for new mining companies and, basically,

companies organized within two years. There is, therefore, no fiscal record.

Stake and Interest of Promoters

It is patent that for a registrant which has no fiscal history the manner of its creation and the persons responsible therefor are of vital importance. It must be borne in mind, as stated above, that the form is drawn for securities to be offered, in a number of instances, far from the locality in which the mine is located. There is no personal knowledge by the investor of the persons responsible for setting up the company. Certain information, therefore, has been asked concerning the past experience of the promoters. Thereafter questions are directed to the securities to be held by the promoters, the nature and amount of rewards of any kind to be received by them, their material contracts with the registrant, and the arrangements, if any, whereby the promoters are to obtain any portion of the discounts and commissions in the sale of securities.

Since the public investing cash is entering into a joint venture with the promoters, it would seem clear that a full and frank disclosure of the stake and interest of the promoters is necessary in order for the formation of a business judgment.

The next items are concerned with the basis upon which the company has issued or is to issue securities in consideration of property or services, or has acquired or is to acquire property, other than in the ordinary course of business, for any other consideration. A statement is required as to the method of valuation of such property and, if acquired by the registrant from a person who has an inside relationship to the registrant, as to the cost of the property to such person. Since the registrant has no fiscal history, it is manifest that such a picture must be given of the mode of its capital structure and the basis upon which securities have been issued, in order to obtain a clear comprehension of the business transaction involved.

Method of Distributing Securities

The next series of questions is concerned with the method by which the

securities are to be distributed. For example, a general statement as to the underwriter; a statement whether the issue has been firmly committed; a table showing the spread or profit to the underwriter involved in the distribution, and discounts and commissions to be received by dealers; information as to whether a market is to be maintained for the securities; and information as to material underwriting arrangements.

The materiality of this information cannot be questioned. Its value for investment judgment is presently universally recognized.

There is next required to be set forth clearly the effective price paid for the securities of the registrant by the several parties engaged in the common venture—namely, the promoter, the underwriter, and the public. In case securities have been acquired for other than cash, the cost of the securities is required to be set forth, other than in certain

cases, on the basis of cost price to the respective party of the consideration for which the securities were issued to him.

Property Description and Development Program

Thereafter is required a general description of the property, giving its location, means of access thereto, its history, an indication of the title thereto, a description of its present condition, and the equipment thereon, if any. If held by lease or option, a description of the terms of the lease is required.

A brief description of the proposed program of exploration, development and operation is then asked for.

Following a statement as to any metallurgical tests and a description of the sampling, if any, a statement is required as to whether any ore bodies have been sufficiently developed to justify designation as "proven" or "probable" ore. Here again we have terms that do not have a universality of meaning. The definitions have been included, therefore, for the purpose of seeking to obtain a greater precision and to remedy difficulties. As stated above, these definitions have from time to time been overlooked.

"Proven" and "probable" ore are defined in the instruction book as follows:

"Proven ore—the term 'proven ore' means a block of ore so extensively surrounded by sampled faces that the risk of failure in continuity is reduced to a minimum.

"Probable ore—the term 'probable ore' means ore as to which the risk of failure in continuity is greater than for proven ore, but as to which there is sufficient warrant for assuming continuity of the ore."

There then follow questions relating to any body of "proven" or "probable" ore. It is to be noted that these items need not be answered if there is no claim that there is "proven" and "probable" ore. If claimed, however, the amount of "proven" and "probable" ore and the respective constituents of the ore bodies are to be given; and, in such case, an estimate of cost of recovery.

An indication of the three principal markets in which each commercial constituent is to be sold, in case it is not to be sold for its gold, silver or other metal content is then required. For companies mining only gold, silver or metallics, this information need not, of course, be given.

There is then required the material provisions of any marketing contract. Manifestly, if there is no such contract, a statement to that effect will suffice.

An opportunity is accorded to make a statement concerning ore which is other than "proven" or "probable" ore.

Application of Proceeds

The next series of questions is concerned with the proceeds and the application thereof. Since the public is asked to put up cash, it should have, manifestly, a clear statement as to the use of that cash. Investment judgment cannot be made without the possession of knowledge as to how the money is to be used. Such a requirement may well serve to direct more money to the ground. It is asked what use will be made of the proceeds if a sufficient amount is not obtained to accomplish the program previously described; and whether an escrow arrangement has been made for the funds, if sufficient securities are not sold in order to undertake the proposed program.

There is then required an indication of the officers and their contemplated salaries, and the securities held by them, and of the persons holding more than 10 percent of any class of voting securities, and the securities held by them.



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The next questions require a description of the securities of the company; for example, dividend rights, voting rights, etc.

There is an example between the practices in the different parts of the country. Generally I would say in the West you have one class of security. In the East that is not the practice. Patently, if you were having two classes of common stock, a class of preferred stock, a class of debentures, etc., you could just as well have two classes. There must be, to the investor, a clear enunciation of the different categories of the securities if he is to form a judgment as to what is being offered.

Then follow several miscellaneous questions calling, for example, for a resume of material contracts and material litigation.

This completes the registration statement proper. In addition, the registrant is asked to file certain schedules showing the financial condition, namely:

- I. Current Assets and Current Liabilities.
 - II. Liabilities Other Than Current Liabilities.
 - III. Amounts Due to and from Promoters, Underwriters and other persons Connected with the Registrant.
 - IV. Assets (other than current assets) and Capitalized Expenses.
 - V. Table of Capital Stock and Related Items.
- No balance sheet is required.

In addition, there is required to be furnished a statement of Cash Receipts and Disbursements since the inception of the company.

Manifestly, for a new company there should be, at the time of offering of securities, an accounting for the moneys received and for disbursements up to the time the securities are being offered to the public. I am certain you will agree that our requirements could not be simpler, and certainly if proper records had been kept they should furnish no difficulty.

Exhibits Required

To complete the registration, there is required a certain number of exhibits, the most important ones being as follows (of course these exhibits must be in the possession of the registrant): charter and by-laws; copies of material contracts; a copy of any report concerning the property, if such report is referred to as the source of any fact, or as the basis for any conclusions; and copy of the district map or maps

showing the location of each mining property.

There are also required Plans and Sections, under certain conditions which are essentially as follows:

If there are only surface workings, only a surface map need be filed. In other words, I think you will see that we are asking for a statement of the facts of the company as it exists.

If there are undersurface developments, plans and sections are to be filed. Such plans and sections must show the approximate location of all shafts, tunnels, stopes, and other excavations and openings. The extent to which mine workings are at present inaccessible is to be indicated, if practicable. *If ore blocks are claimed*, but not otherwise, the outlines of all ore blocks, suitably labeled, are to be made on such plans and sections.

If the registrant has sampled ore exposures that are still in place, and only if such sampling has been made, the exhibits above indicated are to be so prepared as to contain the pertinent sample and assay data derived from such sampling.

There are also required a list of names and addresses of all assayers or smelter companies who have issued certificates substantiating the sample values shown, copies of all calculations of weight or volume and value of proven or probable ore, and an opinion of counsel as to the legality of the issue of the securities of the registrant.

In addition, if securities have been or are to be issued for property or services, a statement signed by the majority of the board of directors is required relating to the basis of valuation and the cash value of the property or services. A further statement is required in regard to securities issued at a discount.

We have 48 sovereign states; we have 48 sovereign laws. Each of those laws differs as to the basis on which you can issue securities and as to the methods of valuation. If securities are to be issued and sold to a resident of the State of Virginia or the State of Pennsylvania, he cannot be assumed to know the State law of Nevada, the law of the State of Colorado, the law of the Province of Ontario, the law of Mexico, the law of any place in the world, and that is, of course, the reason why. In order to meet the duty imposed of getting to the investor information by which he can form a judgment, such a requirement would seem to be necessary.

I may say again, by way of parenthesis, because it cannot be too often accentuated, that the Securities Act,

as the Chairman has said in an address made somewhere—I have forgotten where—"This is a democratic statute whose object is to get the facts to the investor—the man to whom the securities are offered—by which he can form a judgment as to whether or not he will buy the security offered to him."

Such are the requirements for registration. I think that you will agree that there is no information therein required which is not necessary for investment judgment, and that the Commission in the performance of its duty could ask for less. Indeed, I think you will agree that any registrant should have in hand the information required even before filing. The form before its adoption was submitted to a large group of experts in various parts of the country, and all their comments and criticism were given the most careful consideration in the final determination of the requirements. Experts of distinction and high reputation have stated that they are just and reasonable.

It can hardly be questioned that the requirement that the basic information above described be furnished will tend in the long run to conserve capital for investment in mining securities, since thereby will be impeded the issuance of that class of mining securities which all deplore who have the interests of the mining industry at heart—namely, those securities, the proceeds of which vanish before they reach the ground.

Coal Expert Testifies on Employment

An outline of the present trend of production and employment in the bituminous coal industry was presented before the Senate Committee investigating unemployment on January 14 by Dr. F. G. Tryon of the National Bituminous Coal Commission.

After giving a brief account of the production of bituminous coal in 1937 compared with 1936, Dr. Tryon stated that employment in the bituminous industry showed a substantial improvement from the depression level of 1932, increasing steadily through 1936. From present indications, he stated that the average number of men employed in 1937 was slightly higher than the previous year. Following the trend of production, employment also started a decline beginning in mid-October.



WHEELS of Government

ADJOURNMENT of the special session on December 21 found but little to show for the work of the Congress from November 15. The Farm Bill and the Housing Bill were passed and sent to conference. Particularly in the case of the Farm Bill there was and still is disagreement between the various agricultural factions, and it may be weeks before an agreement can be reached, if at all.

The President's message to the third session of the 75th Congress on January 3 indicated a continued desire for some form of wage-hour legislation. In addition to the Revenue Bill of 1938, government reorganization, relief and regional planning, there remained before the Congress bills and proposals dealing with stream pollution, Social Security Act amendments, federal licensing of corporations, Federal Trade Commission amendments, Securities and Exchange amendments, Maritime Act amendments, Government Contracts Act (Walsh-Healy) amendments, National Labor Relations Act amendments, natural gas regulation, the Anti-Lynching Bill, the Short Train Bill and the Patman Manufacturer-Retail Separation Bill—all of this in addition to the regular departmental supply bills. During the month of January the Senate has confined its activities largely to debate and time-killing on the Anti-Lynching Bill. This issue is extremely bitter and during the month opposition of the Southern Senators has been strengthened by a number of their colleagues from the North and West. In the House the Independent Office Appropriation Bill and the Treasury Post Office Bill have been passed and the remainder of the supply bills of this type are now scheduled to be handled at the rate of one each week.

The President's budget message indicated no hope of a balance for the fiscal year 1939. The indicated deficit is little short of \$1,000,000,000 and observers are predicting a \$2,000,000,000 deficit and expressing concern that there will not be a balanced budget for some years. The budget situation

• As Viewed by A. W. Dickinson of the American Mining Congress

is subject to considerable modification, moreover, by possible additional requirements for relief, pump priming and national defense.

Taxation

On January 14 the labors of Chairman Fred Vinson's Ways and Means Subcommittee were made public in a 91-page report to the full Committee. Hearings based on this report began on Saturday, January 15, before the Committee on Ways and Means. The Treasury Department, represented by Under-Secretary Roswell Magill, opened the hearings with a one hour and 30 minute appearance which included questioning by individual members of the Committee. In effect, Mr. Magill gave approval to the recommendations of the Subcommittee with which he and other representatives of the Treasury had worked constantly for months.

Of pointed interest to the mining industry was the mention in the Subcommittee report of the depletion deductions for mining which reads as follows:

"Community Property and Percentage Depletion"

"The subcommittee has discussed the question of community property and percentage oil and mining depletion which have long been the subject of controversy. It has been evident that the time element will not permit the subcommittee to present a recommendation on these subjects. Therefore, these questions have been passed over for the present and they are referred to the full committee for future study and consideration."

In presenting the position of the Treasury, Under-Secretary Magill spoke on this subject as follows:

"The subcommittee did not undertake to recommend amendments at this time upon all the subjects which were presented to it. In the President's message of June 1, 1937, reference was made to the desirability of improving the provisions of the law relative to the taxation of the income of persons residing in the community property states; and relative to the deduction for depletion by oil and mining corporations on a percentage basis. The subcommittee has recommended that both of these subjects be referred to the staff for further consideration, since it was desirous of reporting this bill within a reasonably short period, and since both topics appear to require extended study."

As Chairman Doughton of the Committee on Ways and Means has expressed his intention to terminate the hearings on January 21 in order to speed the writing and passage of the Revenue Bill of 1938, the above expressions concerning percentage depletion are believed to mean that there will be no change in the provisions of the present law in the new bill.

The report of the Subcommittee recommends a corporation tax rate of 20 percent with credits for dividend distributions which may bring the rate down to 16 percent. Corporations with a net income of not more than \$25,000 are to be taxed 12½ percent on the first \$5,000; 14 percent on the next \$15,000; and 16 percent on the last \$5,000. On corporations with a net income slightly above \$25,000, a new and complicated method of rate computation has been

devised which will probably be subject to change in the course of further committee consideration.

Closely held corporations (ranging from those in which half of the stock is held by one individual to those in which more than 75 percent of the stock is held by 10 or less individuals) are made the subject of a new Title I-B wherein the tax is 20 percent on the "undistributed Title I-B net income" in addition to the tax provided for above. Reference should be made to the report of the Subcommittee for detail on these extremely complicated provisions. The Subcommittee has given a re-declaration of capital stock value for purposes of capital-stock and excess-profits taxes, applicable to the return to be filed for the year 1939, and for every three years thereafter.

It is difficult to foresee the course of the coming Revenue Bill. With some minor changes the bill will probably be reported by the Committee and quickly passed by the House. In the Senate, sentiment is very strong for the complete repeal of the present undistributed corporate earnings tax as well as for complete abandonment of such a tax principle. Inasmuch as there is no immediate prospect of balancing the budget, the Senate may act to remove this tax, but when the bill goes to conference, the House conferees may be expected to stand adamant for their version of the bill. Whether popular demand will be strong enough to overcome this situation remains to be seen.

Wage-Hour

While Rules Committee Chairman John O'Connor's question, "Who wants the bill anyway?" still remains unanswered, Chairman Mary Norton of the House Committee on Labor has had several meetings of her Committee to consider the further course of wage-hour legislation. Commentators indicate that the primary elections which begin in the spring are a material influence in the situation, but that many members of Congress who would like to record a vote for a wage-hour bill do not favor the enactment of such a measure. There is a controversial situation within the Labor Committee, members differing as to what procedure should be followed. The general feeling seems to be that a modified form of bill should be reported out under the number S. 2475 which was borne by the original Black-Connery measure when it passed the Senate. On January 17 the House Committee on Labor voted to post-

pone further consideration of the problem for 30 days to allow a period for further investigation and crystallization of thought. In the meantime additional wage-hour bills have been introduced by Representative Starnes of Alabama and Eicher of Iowa, but these measures are not considered seriously at this time.

Stream Pollution

During the past month there has been no move toward a meeting of the conferees on the Vinson Stream Pollution Bill. On January 17 the House Committee on Rivers and Harbors began the rewriting of the Regional Planning Bill, and it is known that the Committee will eliminate all stream pollution features from the measure, as the Committee prefers that this be dealt with in a separate bill. Senator Barkley, majority leader for the ad-

ministration, has recently indicated that no move will be made from the Senate side to consider the Vinson Bill in conference, at least until some disposition is made in the Senate of the bitter struggle over the Anti-Lynching Bill.

Anti-Trust

The anti-trust pronouncements contained in the speeches of Secretary of the Interior Harold Ickes and Assistant Attorney-General Robert Jackson have been somewhat tempered by subsequent administration action. There has been no bill introduced for the tightening of anti-trust laws and the President's conferences of the past month indicate a greater concern over the economic picture than the alleged harmfulness of so-called monopolistic practices. There is no indication of

(Concluded on page 84)

Along Constitution Avenue, Washington, D. C.





MORONI HEINER



GEO. H. RUPP

STATE CHAIRMEN



JOHN R. SHARP



A. J. RUFFINI

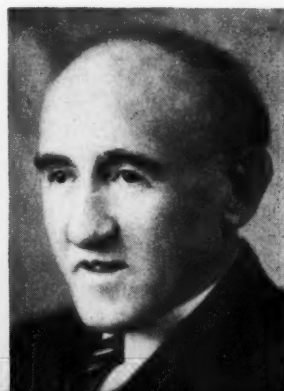
L. T. PUTMAN



JAS. HYSLOP



C. S. BLAIR



CARL T. HAYDEN



Program Committee Cincinnati, Ohio

THE program for the Annual Coal Convention of the American Mining Congress to be held in Cincinnati, Ohio, May 2-6, is already in the process of formation. Organization of the program committee was completed the early part of January, and State Committees have been set up in 17 of the coal producing States, extending from the anthracite fields of Pennsylvania to the Pacific Coast. The State Chairmen and those who have accepted membership on these committees are recognized throughout the country as leaders among the operating men of the coal industry, and their united effort assures that the papers and discussions on mining subjects will this year be of higher quality than ever before.

The Annual Coal Convention and Exposition of the American Mining Congress has become a national event. For 15 consecutive years the sequence of these meetings has not been broken and as a result there has been devel-

oped within the industry a constructive spirit of cooperation and willingness to help each other that has been largely responsible for the development of improved methods and modernized equipment.

Since the first of these conventions was held in 1924, coal mining has seen many changes. Mines have been made safer, underground conditions have improved, electrical power has come into general use in replacing animal haulage and eliminating much of the drudgery of hand labor. Refinements in the preparation of coal for the consumer, such as accurate sizing, removal of impurities and the elimination of dust, have been among the developments that have taken place during this period.

The coming convention bids fair to surpass those of preceding years, both as to the care and thought that will be given in the preparation of the papers and in the nature of the machinery exhibits to be displayed. It is

STATE CHAIRMEN



HARRY L. VIERS



W. C. SHANK



HEBER DENMAN

ee - Coal Convention May 2-6

evident that the subjects of safety, coal preparation and the more efficient application of power driven machinery are uppermost in the minds of the coal operating men today. This has been clearly indicated at the meetings of the State Committees which have already been held for the purpose of recommending to the National Program Committee the subjects to be discussed at the Cincinnati convention.

During the week of January 10, meetings of the State Committees in the Appalachian field and in the Middle Western States were held at four places—Charleston, W. Va.; Pittsburgh, Pa.; Chicago, Ill.; and Middlesboro, Ky. These meetings were well attended by representatives from eight major coal producing States east of the Mississippi as shown in the following accounts. In the more scattered areas of the West where distances are so great that meetings are difficult, the committees have functioned largely

by correspondence with their State Chairmen.

West Virginia Committee

This meeting was held at the Daniel Boone Hotel, Charleston, January 10, 1938, with L. T. Putman of the Raleigh-Wyoming Mining Company presiding as State Chairman. Following are other members who were present:

Charles W. Connor, *Nellis Coal Corporation*; J. O. Cree, *West Virginia Engineering Co.*; T. W. Guy, consulting engineer; S. C. Higgins, *New River Coal Operators Assn.*; H. B. Husband, *Chesapeake & Ohio Railway Co.*; Harry G. Kennedy, *Kanawha Coal Operators Assn.*; W. E. E. Koepler, *Pocahontas Operators Assn.*; R. H. Morris, *Gauley Mountain Coal Co.*; H. P. Musser, *West Virginia Engineering Co.*; D. A. Reed, *Consolidation Coal Co.*; L. E. Woods, *Red Jacket Coal Corp.*; and G. B.



ALBERT GATELY



G. T. STEVENS

D. E. GRIFFITH



L. C. CAMPBELL



D. S. HANLEY



G. A. KNOX



Southward, mechanization engineer, *American Mining Congress*.

Pennsylvania & Ohio Committees

A joint meeting of the Pennsylvania and Ohio committees was held at the William Penn Hotel, Pittsburgh, on January 11. L. C. Campbell, State Chairman of Pennsylvania Bituminous, presided at the morning session, and A. J. Ruffini, State Chairman of Ohio, presided at the afternoon session. Other members present were:

J. M. Connor, *Allegheny-Pittsburgh Coal Co.*; M. L. Coulter, *Clearfield Bituminous Coal Corp.*; F. B. Dunbar, *Mather Colls.*; Thos. G. Fear, *H. C. Frick Coke Co.*; F. T. Fitzharris, *Carnegie Coal Corp.*; C. W. Gibbs, *Harwick Coal & Coke Co.*; T. R. Johns, *Industrial Collieries Corp.*; A. B. Kelley, *Humpbreys Coal & Coke Co.*; T. F. McCarthy, *Clearfield Bituminous Coal Corp.*; G. F. Osler, *Geo. S. Baton and Co.*; R. G. Pfahler, *The Berwind-White Coal Mining Co.*; R. T. Todhunter, *Barnes & Tucker Co.*; L. E. Young, *Pittsburgh Coal Co.*; Julian D. Conover, secretary, and G. B. Southward, mechanization engineer, *American Mining Congress*.

Illinois & Indiana Committees

A joint meeting of the Illinois and Indiana committees was held at the Palmer House, Chicago, on January 12. Carl T. Hayden, State Chairman of Illinois, presided at the morn-

ing session, and James Hyslop, State Chairman of Indiana, presided at the afternoon session. Other members present were:

K. R. Bixby, *Midland Elec. Coal Corp.*; C. F. Hamilton, *Binkley Coal Co.*; Geo. B. Harrington, *Chicago, Wilmington & Franklin Coal Corp.*; G. S. Jenkins, *Consolidated Coal Co.*; Carl Lee, *Peabody Coal Co.*; Marvin M. Moser, *United Electric Coal Cos.*; T. C. Mullins, *Sunlight Coal Co.*; H. H. Taylor, Jr., *Franklin County Coal Corp.*; C. W. Waterman, *McNally-Pittsburg Manufacturing Corp.*; Fred S. Wilkey, *Illinois Coal Operators Assn.*; Julian D. Conover, secretary, and G. B. Southward, mechanization engineer, *American Mining Congress*.

Kentucky-Virginia-Tennessee Committees

A joint meeting of the Kentucky, Virginia and Tennessee committees was held at the Cumberland Hotel, Middlesboro, January 14. E. R. Price (in the absence of Harry LaViers, State Chairman of Kentucky) presided at the morning session. George T. Stevens, State Chairman of Virginia, presided at the luncheon session, and D. E. Griffith, State Chairman of Tennessee, presided at the afternoon session. Other members present were:

C. F. Connelly, *Kemmerer Gem Coal Co.*; E. P. Humphrey, *Stonega*

Coke & Coal Co.; S. G. Moore, *Clinchmore Coal Mining Co.*; George Pow, *Elk Horn Coal Corp.*; J. D. Rogers, *Stonega Coke & Coal Co.*; J. J. Sellers, *Virginia Iron Coal & Coke Co.*; R. L. Wilhelm, *New Jellico Coal Co.*; and G. B. Southward, mechanization engineer, *American Mining Congress*.

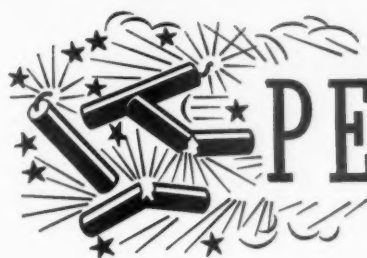
Other meetings have been held by the various State Committees over a wide area, including one at Fort Smith, Ark., January 3, by the Arkansas-Oklahoma Committee; at Birmingham, Ala., January 24, by the Alabama Committee, and at Seattle. In addition, many valuable suggestions have been received through extensive correspondence, all indicating much general discussion and keen interest in the 1938 program.

National Program Committee Meeting

The meeting of the National Program Committee, held at the Netherland Plaza Hotel, Cincinnati, Ohio, January 28, was attended by the various state chairmen and several members of the Manufacturers Division, under the direction of R. L. Ireland, Jr., national chairman. The recommendations of the state committees were considered and a complete convention program was outlined. A more detailed account of this important meeting with preliminary program will be carried in the March issue of the Journal.

Crowded Meeting Room at Music Hall. Inset, R. L. Ireland, Jr., National Chairman, Program Committee





PERMISSIBLES

The brain trusters might be a smart set of chaps when it comes to running the Government but we'd like to see them manage General Motors, U. S. Steel, General Electric, or Anaconda for a year and then let the workers—not the stockholders—vote whether or not they should be retained. . . .

It looks like we're in for a wave of economy. . . . The President tells the Congress the Government shouldn't ever spend more than \$7,000,000,000 a year! . . .

One nice thing about the Stanley Reed nomination for the Supreme Court was that the Ku Klux Klan didn't have to meet and pass resolutions of thanks to the Administration. . . .

In this country more people than ever before are living beyond the age of 65. . . . Well, we never thought those social security pensions were that much of an inducement. . . .

You can call it a breathing spell for business if you want to but it seems to have left business a bit breathless. . . .

Economy has arrived with a vengeance in Government departments. . . . Down at Farm Credit the employees have been exhorted to cut down the use of paper clips. . . . It seems that if each employee avoided wasting one paper clip each day, the agency would save 4,500 boxes of clips a year, clipping its present 22,000 box outlay to 17,500. . . . The next day an investigation of waste paper baskets disclosed from three to 17 clips thrown away! . . .

After all, it isn't fair to bawl out the employe who is always watching the clock. . . . He may be in training for the night watchman's job. . . .

This New Deal is a whooping success. . . . It has averted the immediate danger of being overwhelmed by a boom. . . .

The Republicans agreed on a head in selecting Glen Frank. . . . Now if they can only find a body and a tail the elephant will be whole again. . . .

You can't really say that the Briand-Kellogg anti-war pact hasn't been a success. . . . After all, ever since it was signed, all wars have been undeclared wars. . . .

A lot of people don't agree with the President but they admit he knows what he's talking about when he says it will be some time yet before we have a balanced budget. . . .

You've got just one chance in 127,000,000 to become President. . . . And the odds go up a hundred fold if Mr. Farley's patronage machine opposes you. . . .

There are signs of improvement on the American scene. . . . The country is beginning to insist on conducting a government without the use of so many initials. . . .

Well, they can't blame Herbert Hoover for this depression. . . .

In our generation the biggest figure we ever heard of was the 3,000,000,000,000 miles separating the earth from the nearest star. . . . In the coming generation school teachers can talk about the size of the public debt. . . .

When you stop to think that the Congress is wrestling with a farm bill of 30,000 words, it's easy to see why farmers are convinced that they really are getting something. . . .

Now that scientists have announced that they have succeeded in deodorizing the cabbage, they might turn their attention to politics. . . .

In Detroit a woman was fined \$50 for hitting a deputy collector of internal revenue. . . . It's a good thing they can't fine you for what you are thinking when you make out your income tax return. . . .

It looks like Japan is weakening. . . . Her latest note practically admitted that she remembered the incident. . . .

Fashion note says that padded pants will be the latest in men's wear. . . . A big market exists among those business men who have been getting kicked around the past three years. . . .

Figures may not be interesting but play these on your adding machine. . . . The 1939 budget calls for the expenditure of \$13,450 a minute all during the next fiscal year. . . . That means \$19,367,000 a day from July 1, 1938, to June 30, 1939. . . . It really isn't bad when you realize that the average daily expenditure the past six months was \$20,996,000. . . .



NEWS and VIEWS

Officers Elected

The New River and Winding Gulf Electrical and Mechanical Institute recently elected the following officers for the year 1938: John H. Collins, Appalachian Power Company, president; G. E. Via, Lecony Smokeless Coal Company, first vice president; E. A. Miller, Koppers Coal Company, second vice president; and M. K. Clay, Raleigh Coal and Coke Company, secretary-treasurer. K. F. Humphries, New River Company, is the retiring president.

R. F. C. Mining Loans

Total loans authorized by the Reconstruction Finance Corporation for mining, milling, or smelting of ores, from February 2, 1932, to September 30, 1937, have amounted to \$11,030,500. Of this amount, \$6,586,000 has been withdrawn or canceled, and \$2,957,500 has been disbursed. Repayments have amounted to \$792,694, with the amount outstanding as of September 30, 1937, \$2,164,806.

Anthracite Proposals

An appeal to the President was made by Governor Earle of Pennsylvania, January 17, for Federal action to break up alleged monopolistic practices among anthracite producers. After the conference, Earle revealed that the Department of Justice was investigating the charges of monopoly to determine the applicability of anti-trust statutes to meet the situation.

The following day the Governor held a conference with representatives of anthracite operators, the United Mine Workers of America and members of the Anthracite Industry Commission at Harrisburg, Pa. Among numerous plans aimed at stabilizing anthracite discussed at this conference were voluntary allocation of production, removal of the Canadian tariff on anthracite, legislation which would improve competitive position of anthracite with fuel oil, an anthracite

control act similar to the Guffey Act for the bituminous coal industry, or an amendment to the Guffey Act to include anthracite. Following the conference, Earle announced that a request would be made that the Federal Government assume ownership of Pennsylvania anthracite industries.

On January 25, Governor Earle personally laid before President Roosevelt a program calling for government ownership and regulation with private operation of the industry. This proposal is somewhat similar to that recently presented to the British Parliament under which the Government would own all coal lands but would lease them to private industries under Government regulation. President Roosevelt has made no public comment on the nationalization plan.

Sulphur Industry Near Record Levels in 1937

The American sulphur industry in 1937 had the second best year in its history, with shipments reaching 99.3 percent of the 1929 peak of 2,437,238 tons, according to a recent statement by Langbourne M. Williams, Jr., president of Freeport Sulphur Company. According to preliminary estimates, the 1937 tonnage exceeded 2,400,000 tons, representing a gain of 22 percent over 1936 shipments. This is much nearer the 1929 level than is the general index of industrial activity, and indicates the strength and vitality of the sulphur industry which over a long period of years has continued to show a steady expansion.

The trend toward increasingly higher taxes on natural resources which must compete in world markets remains the greatest burden on the sulphur industry. This situation is being relieved in one quarter, however, by official recognition of this handicap by Richard W. Leche, Governor of Louisiana, who has been successfully campaigning for new industry by assuring equitable tax policies toward business.

In pursuance of this policy, Mr.

Williams states, official assurance has been given the Freeport Sulphur Company by the Louisiana State Board of Commerce and Industry that action is to be expected at this year's session of the legislature to adjust the disparity between the \$2 a ton Louisiana tax on sulphur, and the \$1.03 a ton Texas levy.

On the strength of these assurances and at the request of the State Board that production in Louisiana be increased and the \$300,000 model community development at Port Sulphur be resumed, the Freeport Company increased its output of sulphur in the State from 117,300 tons in the first six months of 1937 to about 230,000 tons in the final six months.

In 1937 the productive facilities of acid plants were taxed to capacity, prompting several manufacturers to increase production capacity of their plants.

Continuation of the extraordinary growth in 1937 of rayon, cellophane, film and resins is encouraging to sulphur producers because the use of sulphur is necessary in several stages, in the manufacture of these products. It is estimated, for instance, that an average of 100 pounds of sulphur are consumed in the manufacture of 100 pounds of viscose rayon.

Gratifying results have also been achieved from this industry's efforts to increase the regular use of sulphur by the farmer for the control of insects and plant diseases. With crude sulphur—99½ percent pure—remaining at less than one cent a pound, the American farmer has been able to make extensive use of sulphur in this connection.

Northwest Magnesite

Operations of the Northwest Magnesite Company, located about 40 miles north of Spokane, have been closed down for perhaps two months, according to a statement by Earl Garber, manager of the property. Approximately 350 men are normally employed at the operation.

Silver Price Reduced

In a dramatic announcement made only three hours before the year 1937 came to a close, President Roosevelt lowered the price the Treasury will pay for newly mined domestic silver from 77.57 cents to 64.64 cents per ounce.

In thus lowering the price, the seigniorage or book profit of the Treasury in these purchases is raised from 40 to 50 percent, or an increase in profit of 25 percent.

Following is the President's proclamation:

RELATING TO NEWLY-MINED DOMESTIC SILVER

BY THE PRESIDENT OF THE UNITED STATES OF AMERICA—A PROCLAMATION

WHEREAS by Proclamation of the twenty-first day of December, 1933, as modified by Proclamations of the ninth day of August, 1934, and the tenth and twenty-fourth days of April, 1935, the United States coinage mints are directed to receive for coinage and addition to the monetary stocks of the United States silver mined subsequent to December 21, 1933, from natural deposits in the United States or any place subject to the jurisdiction thereof; and

WHEREAS such Proclamation as so modified states in part that:

"This proclamation shall remain in force and effect until the thirty-first day of December, 1937, unless repealed or modified by Act of Congress or by subsequent proclamation." and that

"Notice is hereby given that I reserve the right by virtue of the authority vested in me to revoke or modify this proclamation as the interest of the United States may seem to require."

NOW, THEREFORE, finding that the interests of the United States require further modification of said Proclamation of the twenty-first day of December, 1933, as so modified; by virtue of the power in me vested by the Act of Congress cited in said Proclamation, and other legislation designed for national recovery, and by virtue of all other authority in me vested;

I, FRANKLIN D. ROOSEVELT, President of the United States of America, do hereby further modify the said Proclamation of the twenty-first day of December, 1933, so that the same shall remain in force and effect until the thirty-first day of December, 1938, and so that the amount of deduction for seigniorage, brassage, coinage and other mint charges from the monetary value of silver delivered thereunder which has been mined on or after January 1, 1938, shall be 50 percent of such monetary value; and I do proclaim and direct that, with respect to all silver received by a United States coinage mint under the provisions of the said Proclamation of the twenty-first day of December, 1933, which such mint, subject to regulations prescribed hereunder by the Secretary of the Treasury, is satisfied has been mined on or after January 1, 1938, from natural deposits in the United States or any place subject to the jurisdiction thereof, the deduction for seigniorage and services performed by the Government shall be 50 percent and there shall be returned therefor, in stand-

ard silver dollars, silver certificates, or any other coin or currency of the United States, the monetary value of the silver so received (that is, \$1.2929 per fine ounce), less such deduction of 50 percent, and that the said Proclamation of the twenty-first day of December, 1933, as heretofore and hereby modified shall remain in force and effect until the thirty-first day of December, 1938, unless repealed or further modified by Act of Congress or by subsequent Proclamation.

Notice is hereby given that I reserve the right by virtue of the authority vested in me to revoke or modify this Proclamation as the interests of the United States may seem to require.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the United States to be affixed.

Done at the City of Washington, this 30th day of December, in the year of our Lord nineteen hundred and thirty-seven, and of the Independence of the United States of America the one hundred and sixty-second.

(Signed) FRANKLIN D. ROOSEVELT.

By the President:

(Signed) CORDELL HULL,
Secretary of State.

A few days before the announcement concerning the new domestic price was made, announcements were made that the understanding with Mexico and Canada for the purchase of silver had been extended through January. Secretary Morgenthau disclosed that the silver purchase arrangement with Mexico and Canada had been on a month-to-month basis under the present administration.

The arrangements, he stated, were identical so far as price was concerned. Each of the two neighboring nations has the right to offer a fixed amount of silver for purchase by the United States at a price to be determined by the United States Treasury. This price has been between 44 and 45 cents an ounce for some time.

Coal Commission Investigation Approved

On January 10 the Senate Interstate Commerce Committee approved a resolution calling for a searching investigation of the National Bituminous Coal Commission.

The resolution was introduced by Senator Davis of Pennsylvania, and asked specifically that the Commission transmit to the Senate immediately a copy of "serious charges" made by one member of the Commission against another.

Senator Davis' resolution asked for data on information sought by John Carson, Consumers Counsel, which, according to the resolution, were denied to him by the Commission; a list

of employees in the Commission not under Civil Service; a copy of correspondence between the Commission and the General Accounting Office concerning Civil Service, and "also such other information as may be available for the use of the Senate."

H. C. Frick Increases Operations

Pointing toward improved conditions in the steel industry, the H. C. Frick Coal and Coke Company, which supplies U. S. Steel plants, increased operations at its mine early in January to three days a week compared with two days previous to that time. Some of the mines that had been closed since the holiday week were ordered to resume operations on that schedule. Reports indicate that the coal industry in the Pittsburgh area finds the market pretty well saturated with industrial fuel, and many operators believe that much of this may be due to governmental price fixing which became effective recently.

The Pittsburgh Coal Company has reduced its working schedule at its mines to an average of two days a week, and four of its mines are down entirely. This is the lowest level at which the company has operated in many years. However, it is the belief of some well informed men in the industry that this is merely a period of readjustment, and that things will right themselves within the next few months.

Alaskan Operation for Callahan Zinc-Lead

Callahan Zinc-Lead Company of Wallace, Idaho, is refinancing by a new offering of 498,413 shares of stock, the proceeds of which will be used to take up its option on the large acreage of Livengood placers in Alaska, according to Frank Eichelberger of Spokane, who took over the Callahan management a year ago as vice president. Henry B. Van Sinderer is president. Goldfields Consolidated Mines Company of Reno, Nev., has an option to take up 200,000 shares of the new issue at \$2, and the remaining 298,413 shares at \$3 a share.

It is said that 12,000,000 acres of the Alaska ground will run about 60 cents a yard, and that 30,000,000 yards of lower grade gravel can probably be mined at a profit. According

to Mr. Eichelberger's estimates, it will take \$1,000,000 to put in the necessary dredge and other equipment, and that this will be done during the coming season so that mining can start in 1939.

The Callahan Company still is working its Galena property near Wallace, and has its Interstate zinc-lead property.

Magma Costs Rise

Cost of producing copper by the Magma Copper Company, Superior, Ariz., was 7.9 cents per pound for the first 9 months of 1937, compared with 5.6 cents during the entire year 1936, and 5.55 cents during 1935. This is partly accounted for by a full month's shut-down in the summer, which resulted in a cost of 11.6 cents for that quarter.

The above cost figures include all taxes and social security charges, but no mine depletion. Production during the first three quarters of 1937 was 22,586,761 pounds of copper. The average price received by the company was 11 cents per pound during that period.

Approximately 800 men are employed by the Magma Copper Company in its mine, mill and smelter, and production amounts to about 1,000 tons per day, six days a week. Some custom ore is also treated.

Stoker Service Charge for Bootleg Anthracite

That bootleg anthracite in smaller sizes is a factor in the Philadelphia territory, and that it is not satisfactory in automatic equipment, is shown by the fact that a prominent stoker company in that area has sent a letter to all its customers stating that a number of service calls answered by their company recently has been caused by the inferior qualities of bootleg coal. Because of this, the company has decided to make a charge for all service calls originating from the use of bootleg coal.

Marquette Miners Celebrate Christmas Underground

Employees of the Morris iron mine of the Inland Steel Company, located



George Brindzak, miner in the Pittsburgh Coal Company's Somers Mine at Pricedale, Pa., receiving check for \$200, second prize at a Christmas Safety Party held by Company. R. Z. Virgin, right, is making the presentation.

on the Marquette Range of Michigan, again celebrated Christmas underground as has been done recently in the past. With a brilliantly lighted Christmas tree to add color to the surroundings on the 1,400 level, presents were distributed to 228 employees, and a fine program of Christmas music, both vocal and instrumental, was presented. Each employee received a turkey in recognition of a fine safety record.

Safety Promoted by Prizes

The Pittsburgh Coal Company, world's largest producer of bituminous coal, recently distributed more than \$4,000 in cash prizes among the men employed in its Midland, Westland and Somers Mines, in the first of a series of Christmas Safety Parties held by the company as part of an industrial safety program.

By making cash awards to its employees who have worked safely during the last year, the company seeks to enlist the hearty cooperation of employees in protecting themselves while at work. State laws, inspection of mines, and discipline will not prevent careless workmen from receiving injuries.

Most of the large mining companies do more than the law requires in providing machinery, equipment

and methods to avoid explosions and fires. Mines of the Pittsburgh District have been among the first to use approved electric safety lamps, permissible explosives, permissible electric machinery and rock dust. But many accidents occur which are entirely due to the negligence and carelessness of the workman himself.

At times familiarity breeds contempt, recent records showing that experienced miners often are more careless than new workers. During the last four years more than 75 percent of the men who met with fatal accidents in the Pittsburgh Coal Company mines had more than 10 years' experience.

An analysis of the fatal and lost-time accidents occurring in the last four years shows that more than 80 percent of all accidents could have been avoided if the workman had been careful.

Under such circumstances it is clearly evident that the only way a Safety Program can succeed is by enlisting the enthusiastic support and sustained interest of every one on the job. If he can be made to feel that he is sharing in the savings effected by eliminating accidents he will not only work safely but will truly become his brother's keeper.

The practice of presenting cash awards to those who have worked safely has met with splendid response and will be continued by the Pittsburgh Coal Company during 1938.

Banquet of Washington Section, AIME

The annual banquet of the Washington Section of the American Institute of Mining and Metallurgical Engineers was held at the Shoreham Hotel in Washington, January 20, with over 200 in attendance.

R. C. Allen, vice president of Oglebay Norton & Co., and president of the Institute, and A. B. Parsons, secretary, were the guest speakers, and Julian D. Conover, secretary of the American Mining Congress and the new chairman of the Washington Section of the AIME, presided as toastmaster.

Other guests at the speakers' table included Hon. James G. Scrugham, Representative from Nevada; Dr. and Mrs. John W. Finch; Dr. W. C. Mendenhall; and other officers of the local section and their wives. Mrs. M. W. von Bernewitz, chairman of the Washington section of the Woman's Auxiliary, gave an appropriate talk on behalf of the ladies. Arrangements for the banquet were ably handled by a committee headed by Elmer W. Pehrson, of the Bureau of Mines.

Eureka Production

Eureka Mining and Milling Company, at Republic, Wash., produced \$140,784 from 24,242 tons of ore treated at its mill during 1937, according to George A. Kirkbride, president. During the year the company paid \$12,342 in dividends and \$20,000 for a controlling interest in Quilp Gold Mining Company. Returns in gold bullion were \$6.15 per ton from a gross value of \$7.70 per ton. Total ore mined and shipped was 26,715 tons, yielding a gross income from ore shipment and bullion of \$152,238. This company holds and operates the Quilp Mine and Republic Mine on opposite sides of the town of Republic.

Lead Belt Litigation

Late in 1937 in the Federal Court in St. Louis, a ruling in favor of the National Lead Company was handed down for the third consecutive time in a suit brought for occupational disease. Thus ended a long fight waged almost single-handed by James A. Caselton, vice president and secretary of the St. Louis Smelting and Refining Company, subsidiary of National Lead, against a group of St. Louis ambulance-chasing lawyers.

High praise for Mr. Caselton was voiced recently by *The Lead Belt News* in an editorial entitled "An Honest Fighter," from which the following excerpts are taken:

"... Had National not closed their mines it is doubtful that any suits would ever have been filed against the company. St. Louis lawyers had runners in this district for a long time, contracting with former employees on a 50-50 contract basis and it was that type of lawyer Caselton took after and caught as the record will show" ...

"Shooting directly at the seat of litigation, Caselton began a searching investigation that revealed to the public and the claimants themselves the type of lawyers who were fostering this mass of litigation. Needless to say, evidence of violation of all the standards of ethics and rules governing their profession was painstakingly exposed and the shysters began scurrying for cover. But it was too late, for several were caught and suspended. They were not without friends and influence and soon Caselton was importuned to 'take off the heat.'" ...

"The National Lead Company settled with scores of former miners on a nuisance value basis and refused to pay the St. Louis damage suit lawyers one cent on their contracts. Caselton preferred that the former miners receive the full amount of the nuisance value settlement, regardless of how small it was, rather than to allow the victims of the racket to split their settlements with the St. Louis racketeers and their runners, who held an interest in all the cases they chased for the St. Louis clique.

"A number of St. Louis lawyers belonging to the clique that invaded the Lead Belt brought suit against the National Lead Company to collect their fees on small settlements former miners made directly with the company agents. Caselton could have settled with them for very small amounts, but chose to fight it out in the courts. He was upheld each time, even though by fighting it out on the principle of the thing, the costs of resisting their claims amounted to many times the amount the lawyers asked for." ...

"From such timber come the leaders of the nation, both in business and politics."

Pyramid Mine Production

A recent report from Perry County, Ill., states that the famous Pyramid

mine located there achieved the 1937 record of becoming the biggest producing commercial mine in the world. In confirming the report, W. G. Gregory, vice president of the Binkley Coal Company, is quoted as saying:

"Exactly 1,577,067 tons of Pyramid coal were produced and shipped last year to all parts of the Middle West."

Mr. Gregory went on to say that much credit is due C. F. Hamilton and the entire operating department of the Binkley Coal Company for the improvement which has resulted in more efficient production methods.

New Mine in Mercer County

Development of a new coal mine on a 100 acre lease on Flat Top Mountain in Mercer County, W. Va., has recently been announced. The incorporators of the new company are: P. J. Wood, Fred Bowling and J. C. Meador. The coal to be developed by the company is in the Beckley seam.

Alabama Institute Meets

The annual meeting of the Alabama Mining Institute was held late in December at which the following officers were elected for the coming year.

I. W. Rouser, president; W. H. Oldham, C. F. DeBardeleben and R. T. Daniel, vice presidents; Jas. L. Davidson, secretary-treasurer; Hubert E. Mills, assistant secretary and statistician. E. J. Rowe, of Adams, Rowe & Norman, Inc., was elected to the board of governors in place of the late A. B. Aldridge.

Other members of the board elected were: H. L. Badham, H. A. Berg, H. T. DeBardeleben, A. R. Long, Harold McDermott, Hugh Morrow, W. H. Oldham, George F. Peter, J. W. Porter, D. A. Thomas and Herbert Tutwiler.

Walker Mine Resumes With Small Crew

About 100 men returned to work recently at the Walker Mining Company property, Walkermine, Plumas County, Calif., which closed down late in October because of the low market price for copper. According to L. F. Bayer, general manager, the sole purpose of the move was to pro-

vide employment for those of the crew of 500 who remained in camp following the shut-down. About 250 to 300 tons per day will be produced, compared with a normal output of 1,600 to 1,700 tons. The property is owned and operated by the International Smelting Company, of Utah.

Thirty Mills Idle in Tri-State

With the closing of the Jarrett mine and mill of the Federal Mining and Smelting Company in December, a total of 30 mine and tailings plants were listed as idle, having shut down for indefinite periods during the last three months as a result of the sharp recession in ore prices. Sixteen of the inactive properties are mine mills, and the others are tailing plants.

Closing of the properties has affected the employment of between 2,000 and 2,500 men. Daily wages of miners have been reduced generally about \$1.50 during the period but still are about the same level as a year ago.

Koppers Awarded Contract By Republic

The Republic Steel Corporation has awarded a contract to the Koppers Company, Pittsburgh, for the construction of 69 new modern coke ovens to replace the old No. 3 battery which had 61 ovens at its Youngstown plant. This improvement will cost about \$1,250,000.

With the new installation, the coke production will be increased by about 15 percent to 90,000 tons per month. Extensive repairs will also be made to the by-product plant.

The additional coke production is necessitated by recent reconstruction of the No. 3 blast furnace, bringing its capacity from 500 to 825 tons daily. The new coke ovens are to be ready September 15, and the blast furnace by June 1.

Williamson Association Meets

The annual meeting of the Williamson Coal Operators Association was held January 7 at Williamson, W. Va., at which the following officers were elected: L. E. Woods, president of the Red Jacket Coal Corporation, re-elected president, after having served in that capacity for the past seven or



Settling basins used to catch sediment in river from Butte mines—old wood spillways are rotted out and no longer needed. The "Caterpillar" Diesel RD7 and LeTourneau carryall is filling in with earth.

eight years; C. A. Hamill, president of the Sycamore Coal Company, vice president; J. C. McLaughlin, general manager of the Earlston Coal Company, treasurer; and J. J. Ardigo, re-elected secretary.

Reports indicate that about 75 operators were present, being the best representation at any meeting ever held by that association, those in attendance representing about 9,500,000 tons of the total Williamson Field production of about 10,000,000 tons.

Montanans Urge Purchase of Domestic Manganese

At a meeting of the officers and executive committee of the Mining Association of Montana, at Butte, December 16, 1937, the following resolution was passed:

WHEREAS purchases of manganese ores essential in the manufacture of steel have been authorized by the United States Navy; and

WHEREAS manganese ores suitable for metallurgical purposes are available in the United States, especially in the Butte and Philipsburg mining districts in Montana; and

WHEREAS purchases of domestic ores would stimulate the mining and

processing of manganese ores in areas in which there is widespread unemployment: Now therefore be it hereby

Resolved, That preference in the purchase of manganese ores be given to domestic producers; and be it further

Resolved, That copies of this resolution be transmitted to the Congressional and Senatorial representatives of Montana in Washington.

(Signed)

CARL J. TRAUERMAN,
President,

HARRY C. BACORN,
Vice President,

F. C. GILBERT,
Secretary,

FRANCIS A. THOMSON,
Chairman Executive Committee.

Washington Mining Institute

The 11th Annual Mining Institute of the College of Mines, University of Washington, Seattle, was held January 17-22, 1938, at the Mines Laboratory in Seattle.

The program was devoted largely to the active mining, metallurgical, and ceramic industries of the State of Washington. The wide variety of subjects and the importance of those

presenting them is indicated by the following list of papers and authors:

"The Significance of the Mineral Industry" by Dr. Francis A. Thomson; "Safety and Methods in Gold Dredging and Hydraulic Mining" by S. H. Ash; "Limestones of Washington" by Wolf G. Bauer; "The Chelan Copper Mine" by C. P. Browning; "The Coal Industry of Washington" by George Watkin Evans; "Clay Manufacturing in Eastern Washington" by Neil Fosseen; "Steel Manufacture at the Seattle Plant of the Bethlehem Steel Company" by L. G. Knight; "The Pend Oreille Mine and Mill" by C. A. R. Lambly; "Economics of Copper Production" by E. R. Marble; "Placer Mining with Bulldozers" by John A. Miscovich; "Manufacture and Applications of Light Alloys" by Harvey G. Schwarz; "Diatomite in Washington" by Harry E. Sovereign; and "The Application of Jigs in Placer Mining Operations" by D. N. Vedensky.

Members of the University Staff presented the following topics:

"Mining in Washington" by Dean Milnor Roberts; "Mining Law" by Professor J. Grattan O'Bryan; "Geology of Placer Deposits" by Professor J. Hoover Mackin; and "Olivine and Soapstone of Skagit Valley" by Professor Hewitt Wilson.

Interesting sound motion pictures were shown on Thursday afternoon, and a trip was made to the plant of the Northwest Lead Company on Saturday morning.

Arizona Chapter Officers

New officers of the Arizona Chapter of the American Mining Congress, elected at a recent meeting, are as follows: M. Curley, general superintendent of the New Cornelia Copper Company, Ajo, governor; T. H. O'Brien, general manager of the Inspiration Consolidated Copper Company, Inspiration, first vice governor; A. F. Winther, Miami Copper Company, Miami, second vice governor; and C. F. Willis, editor and publisher of *The Mining Journal*, Phoenix, secretary.

Directors elected are as follows: P. G. Beckett, H. A. Clarke, M. Curley, E. F. Hastings, Wm. Koerner, H. M. Lavender, F. W. MacLennan, T. H. O'Brien, Brent N. Rickard, W. M. Saben, R. W. Thomas, and A. S. Winther.

New River Operators Meet

An annual meeting commemorating the 65th anniversary of coal mining in the New River Field of West Virginia, was held by the New River Coal Operators Association at the Mountain Air Hotel in Mt. Hope, December 14. The business meeting was well attended, at which time the operators elected the following officers to serve the association for the coming year:

Gilbert Smith, Fayetteville, president; Owen W. Cox, Laurel Creek, vice president; P. M. Snyder, Mt. Hope, treasurer; and S. C. Higgins, secretary and traffic manager.

The executive committee is as follows:

Gilbert Smith, P. M. Snyder, Edward Graff, R. H. Morris, S. A. Scott, Owen W. Cox, P. C. Thomas, M. C. Milne, F. F. Dixon, and J. W. Garvey.

The annual banquet was held that evening, at which P. C. Thomas, vice president of the Koppers Coal Company, Pittsburgh, Pa., was toastmaster. Addresses were made by John D. Battle, executive secretary of the National Coal Association, who represented Heath Clark, president, who was unable to attend, and by W. C. Hull, vice president of the Chesapeake and Ohio system, Cleveland, Ohio. Attendance at the banquet was approximately 150 coal operators, state and railroad officials.

1938 Mine Inspectors Meeting

The Twenty-ninth Annual Convention of the Mine Inspectors' Institute of America will be held at the St. Nicholas Hotel, Springfield, Ill., June 6, 7, 8, 1938, according to an announcement by C. A. McDowell, secretary.

Local arrangements and entertainment will be directed by James McSherry, director, Department of Mines and Minerals of the State of Illinois. The program will be drawn up by a committee under the chairmanship of J. T. Ryan, vice president, Mine Safety Appliances Company, Pittsburgh.

Rainbow Ownership

A lease and bond has been taken and a payment of \$5,000 made on the property of Rainbow Mining Company of Spokane in the district between Wallace and the Sunshine Mine

by the following men: Frank Eichelberger; James F. McCarthy, president of the Hecla and Polaris Companies; Stanley A. Easton, president of the Bunker Hill Company; and Fred Searls, vice president of Newmont Mining Company. The purchase price is \$250,000.

Colorado Mining Association Convention

With a record attendance, the annual convention of the Colorado Mining Association was held at Pueblo, Colo., January 10 and 11.

A varied program of interesting papers on subjects closely concerned with Colorado mining was presented by leading men in the industry. In addition, moving pictures were shown describing: (1) Construction of the New Golden Gate Bridge, by courtesy of John A. Roebling's Sons; (2) The Story of Lead Smelting, by the U. S. Bureau of Mines; (3) The operations of the Consolidated Mining and Smelting Company, at Trail, British Columbia.

The annual banquet and silver smoker was held the night of the 10th, at which Howard R. Huston, assistant to the president, the American Cyanamid Company, gave the principal address. Speaking on the subject "Freedom in Industry," Mr. Huston declared that if industry is to retain its footing, the abuses and trends of what he termed the present unstable, personal government, must be corrected. After assailing a long list of business regulatory acts passed by the New Deal Administration, Huston told the mining men that the issue in business today is so-called "planned economy" versus freedom of initiative.

The Colorado Mining Association, surveying the field of State and national legislation as it affects the mining industry, passed urgent recommendations for several sweeping changes in existing government policy. Among the most important demands were:

Immediate revision of the undistributed profits tax.

Immediate restoration of the price of 77.57 cents per ounce, for newly mined silver, and continuance of purchases of gold and silver by the government to provide an adequate base for currency.

Modification of the Colorado \$45 a month old-age pension law.

Simplification of SEC regulations

affecting mining, and establishment of a mining unit in the SEC.

Some 800 celebrators jammed Pueblo's State Fair Administration Building the final night for the famed "sow-belly" dinner, which wound up the State's mining convention in a hilarious mood.

Inspiration at Half Capacity

Arizona reports indicate that production at Inspiration Consolidated Copper Company's plant near Globe is a little less than 50 percent of capacity. Earlier in 1937 the concentrators were turning out the equivalent of about 10,000,000 pounds of copper a month, but at present that output has been lowered below the 5,000,000 pound mark, owing to lack of demand and lower copper prices.

Carson Hill Operating at Capacity

The recently enlarged 1,000-ton cyanide plant of the Carson Hill Gold Mining Corporation is operating at capacity under the direction of J. A. Burgess, manager, formerly of Nevada. A crew of 195 men is employed at the property, located near Melones, Calif.

Carson Hill was recently taken over by the Anglo-American Mining Corporation, of which Walter Lyman Brown of San Francisco is president.

Homestake to Modernize Cyanide Mill

According to a recent announcement of Guy N. Bjorge, general manager of the Homestake Mining Company, a contract has been let for the structural steel for reconditioning the cyanide sand plant No. 1. The shell of the present building will be replaced by a steel frame galvanized corrugated-steel sided structure, following closely the design of the newer No. 3 plant.

The construction work will proceed without interfering in any way with the continued operation of the plant, and the work will therefore be slow. It is expected that at least two years will be required to complete it, and the cost will exceed \$300,000.

Homestake continues its steady production of gold ore at the rate of about 4,000 tons per day.

BOOK REVIEW

THE METALLURGY OF GOLD.

By Thomas Kirke Rose and W. A. C. Newman. 7th edition. Charles Griffin and Company, Limited, London, 1937. 561 pages. Price 36 shillings.

THERE was no book on gold equivalent to that by Rose, deceased, nor that now by Rose and Newman. The work has long been a standard for everything connected with gold—its properties, occurrence, and recovery. This seventh edition was needed. It is 40 pages shorter than the sixth edition in 1915, but most of this is accounted for in the reduced space given to the melting and refining of gold bullion.

Three chapters, totaling 80 pages, cover in detail the physical and chemical properties of gold, including microstructure; the alloys of gold, listing the alloying effects of some elements, and the melting of such alloys, with furnace types; and the chemistry of the compounds of gold, such as the chlorides, bromides, cyanides, and oxides.

The chapter on gold placers describes gold-saving by the usual equipment—pan, rocker, sluices, sluicing, hydraulic elevator, and dredge. The statement that dredges "are made in great numbers in New Zealand and in Western America" will bear changing to Australia, California, England, and Holland; and flotation is no longer employed on the Bulolo dredges.

Primary ore crushing, Chapter 6, features different types of rock-breakers and stamps, the latter including the individual Nissen stamp, some of which are operated in South Africa.

All of the phases of amalgamation, with sketches of plate tables, traps, barrels, pans, and retorts, are given. The loss of mercury and its purification receive attention. Blankets and corduroy are mentioned as gold-savers.

Under "Intermediate and Fine Grinding," the ball-mill, rod-mill, tube-mill, gravity-mill, Chilean mill, and Huntington mill get adequate space. Dry ball-milling has a chapter to itself.

The chapter "Gravity Concentration" is a review of screen sizing; hydraulic classification; drag, rake, and spiral classifiers; blanket tables; and shaking tables.

The physics, chemistry, reagents, and means of flotation, with flowsheets of practice are in sufficient detail to inform the millman how to proceed.

The chemistry of roasting sulphides and tellurides, the decomposition of calcium carbonate, the loss of gold in roasting, and the furnace suitable for a sweet roast, are given a brief chapter. This rather gives the impression that the amount of roasting done is small; but if the reviewer's knowledge is correct, roasting is on the increase, especially for concentrates. The Golden Cycle plant is an example of the roasting of a large daily tonnage of ore and concentrates.

Next come four chapters on the cyanide process covering: (1) the chemical reactions, which is technical and well-done; (2) general methods, including preparation of the ore for subsequent treatment by agitation, filtration, and precipitation by zinc and other precipitants, and the clean-up and melting; (3) special methods, such as concentrate treatment, the effect of arsenic, antimony, and copper, and a section on crushing in cyanide solution or water which, the reviewer would insert, depends upon the mineralization of ore; and (4) descriptive examples of cyanidation practice in different countries.

Nobody but the authors of "The Metallurgy of Gold," both of whom have been many years in the Royal Mint, London, are better equipped to write on the melting and refining of gold bullion. Suitable types of furnaces, lessening of losses in fume, and parting of bullion by acid, by chlorine gas, or by electrolysis, are scientifically treated and illustrated.

The last chapter tells briefly how ores may be tested in the laboratory—by sampling, hand examination, microscopic examination, chemical analysis, acidity, crushing and grinding, cyanidation and flotation. The checking of an operating plant is also given.

Chapters 18 and 19, "The Assay of Gold Ores" and "The Assay of Gold Bullion," are important because anyone versed in assaying has reliable instruction in sampling, fluxing, fusing, cupelling, and weighing clean and complex ores and plant by-products; and regular bullion assays and various methods of ascertaining the value of bullion.—M. W. von Bernwitz.

PERSONALS



ARTHUR BENDELARI is spending the month of January enjoying the warm sun of Florida.

W. C. HOOD, formerly assistant general superintendent of the H. C. Frick Company, was appointed general superintendent of the U. S. Coal and Coke Company for the Kentucky and West Virginia operations, according to a recent announcement by Harry Moses, whom he succeeds. Mr. Hood served 20 years in the capacity of assistant general superintendent, and his appointment is effective January 16. He will be stationed at Gary, W. Va.

J. L. SULLIVAN, formerly mine superintendent, U. S. Coal and Coke Company, Gary, W. Va., has been appointed assistant general superintendent of that company, with office at the same address.

SAMUEL E. BOOL, a partner in the firm of Pickands, Mather and Company, recently completed 50 years of association with that concern. A celebration in honor of his 50th anniversary was given Mr. Bool at his office by his business associates.

GEORGE D. BROOKE, executive vice president of the Chesapeake & Ohio Railway, has been elected president and a director of the board of that railroad, succeeding the late W. J. Harrihan.

T. J. McFARLAND, formerly mine inspector of the U. S. Coal and Coke Company, has been appointed assistant general superintendent of the Kentucky Division of that company. His headquarters will be at Lynch, Ky.



THOMAS McNALLY

THOMAS McNALLY, president of McNally - Pittsburgh Manufacturing Corporation, has been appointed by Governor Huxman of Kansas as one of three official representatives from Kansas at the New York and San Francisco World's Fairs to be held next year. Mr. McNally sailed on February 5 with Mrs. McNally for Rio de Janeiro and other southern points.

DR. THOMAS G. CHAPMAN has been appointed dean of the Graduate College of the University of Arizona, Tucson, succeeding the late Dr. Raymond Jackson Leonard. Dr. Chapman will devote one third of his time to the office of the graduate deans and the remainder to his present position as head of the department of mining engineering and metallurgy. He has been active as dean of the Graduate School since last spring, when Dr. Leonard became too ill to serve.

JOSEPH E. HITT has been elected vice president of The Walter Bledsoe & Company, with headquarters in St. Louis.

E. R. HARRIMAN was recently elected a director of Anaconda Copper Mining Company, to fill the vacancy caused by the death of Grayson M. P. Murphy.

HENRY KELLER, superintendent of the Park Colliery of the Lehigh Valley Coal Company, has been named superintendent at Park Colliery and Springdale.

J. E. TOBEY, manager of the Fuel Engineering Division of Appalachian Coals, Inc., spoke at the coal and combustion course held at Case School of Applied Science on January 28. The subject of Mr. Tobey's talk was "Underfeed Stokers from the Standpoint of Coal Selection."

KARL A. PAULY, engineer of the Industrial Department of General Electric Company, has retired from active duty after a total of 39 years of service. He has consented to act in a consulting capacity, however, and will maintain an office in the Industrial Department at Schenectady.



MACK C. LAKE

MACK C. LAKE, who has for many years been employed as geologist for the M. A. Hanna Company, and who has also been employed as consulting engineer and geologist for other clients, has resigned as geologist for the M. A. Hanna Company at the Duluth office, and will soon establish a consulting, geological and mining-engineering office in California, probably in San Francisco. From there he will super-

vise investigation and exploration relating to manganese and copper properties in the West and Southwest controlled by the Hanna Company.

Mr. Lake has had extensive experience throughout the United States and Canada in geological and mining-engineering work relating to the exploration and development of a wide variety of mineral products. He plans on doing general mining consulting work, covering examination, exploration, financing, operating, planning and management of mining properties.

I. N. BAYLESS is now general manager of the Union Pacific Coal Company, his appointment having been effective January 1.

O. G. SWANT, assistant general superintendent of the Hutchinson Coal Company, Macbeth, W. Va., since last summer, has been named general superintendent to succeed W. H. MYERS.

Mr. Swant first came to Logan in 1917 as a mining engineer from Main Island Creek Coal Company, at Omar, where he supervised the opening of the Stirrat and other mines for the company.

Mr. Myers will return to Meadowbrook and assume the duties of general superintendent of the same concern. He was assistant general superintendent there for seventeen years before going to the Logan Field in 1932.

HAMILTON BRUSH, who has been with the sales department of the American Smelting and Refining Company, since 1909, has resigned as vice president in charge of sales, effective January 1. KENNETH BROWNELL, manager of the sales department for five years, is now chief executive officer of that department, having assumed that position the first of the year.

Mr. Brush will continue to be associated actively with the company as a sales consultant and as a director.

JOHN C. MILLER, superintendent at the Springdale operation of the Lehigh Valley Coal Company for the last two years and a former member of the company's engineering corps in Hazleton, has been promoted to division superintendent in charge of Dorrance and Franklin Collieries. The Dorrance Colliery is operating, and the Franklin is now inactive.

FLETCHER W. ROCKWELL, vice president and production manager of the National Lead Company, was elected president of that company at a recent meeting of the board of directors. Mr. Rockwell succeeds F. M. CARTER, who has been on leave of absence for the past year, and whose resignation was regretfully accepted by the directors.

Mr. Rockwell, who has been with the company for over 40 years, is the son of Fletcher W. Rockwell, one of the founders and original incorporators of National Lead Company and vice president from the time of its organization to his death in 1908.

EDWARD J. CORNISH will continue to occupy the office of the chairman of the board, and the policies laid down by him in the past will continue to be followed.

PERRY G. HARRISON, of Crosby, Minn., was elected chairman of the Minnesota Section, A. I. M. M. E. at the annual meeting of the Section held at the School of Mines, University of Minnesota, Minneapolis.



GEO. B. PRYDE

GEORGE B. PRYDE was appointed vice president in charge of operations by the Union Pacific Coal Company, according to an announcement by Eugene McAuliffe, president. Mr. Pryde's appointment was effective January 1.

JOHN C. COSGROVE, recently re-elected chairman of the Committee of Ten of the Coal and Heating Industries, sailed on the *Franconia* January 5 for a trip around the world, the tour to last six months.



ROBERT LINTON

ROBERT LINTON, consulting engineer of Los Angeles, was recently honored by Washington and Jefferson College when he was conferred the honorary degree of Doctor of Science. Degree was conferred during Founders' Day ceremonies.

Mr. Linton is well known among the mining circles, having had wide experience in precious and base metal mining, although most of his recent work has been in non-metallics, where he has served a number of large mining organizations in an executive capacity.

SHELDON JONES, production superintendent of the Lehigh Valley Coal Company, has received a leave of absence because of illness. His duties will be taken over by CARL F. ARBOGAST, superintendent of the Dorrance and Franklin Collieries of that company, who will do field work directed by FRANK H. WAGNER, vice president and general manager of the Lehigh Valley Company.

ALBERT MENDELSON is now manager of the Cananea Consolidated Copper Company, the operating company of Greene Cananea Copper Company. He was formerly superintendent of the Copper Range Company, Painesdale, Mich., having joined the staff at Cananea about a year ago.

U. B. YEAGER has been appointed combustion engineer for the Island Creek Coal Sales Company.

C. A. HIGHT was elected chairman of the board of directors of the United States Smelting Refining and Mining Company at a meeting of the board held at the company's offices in Boston, Mass., January 7.

N. W. RICE was elected president of the company, succeeding Mr. Hight in that position. Mr. Rice has been vice president of the company and associated with it in other capacities for many years.

CLYDE E. WEED has been promoted from general manager of the Cananea Consolidated Copper Company of Mexico to general manager of the Anaconda Copper Mining Company. Mr. Weed's new headquarters will be in New York City. He has been general manager of the Greene, Cananea Mines and Plant for eight years, having gone there from the Inspiration Consolidated Copper Company, of Inspiration, Ariz. Mr. Weed is well known in the copper mining industry.

Recent visitors at the offices of the American Mining Congress included: J. W. ALLEN, Inspiration Consolidated Copper Co., New York; A. B. JESSUP, Consulting Engineer, Lancaster, Pa.; J. F. MCCARTHY, president Hecla Mining Company; H. S. SALMON, Salmon and Cowan, Birmingham, Ala.; C. J. SANDOE, Perry Coal Co., St. Louis, Mo.; and CARL SCHOLZ, Charleston, W. Va.

—Obituaries—

W. MONT FERRY, vice president and managing director of the Silver King Coalition Mines Company, died unexpectedly of a heart ailment at Salt Lake City, January 11. He was one of the most widely known metal mine operators of the West, and was recognized nationally as an authority on silver, mine taxation and mine economics generally.

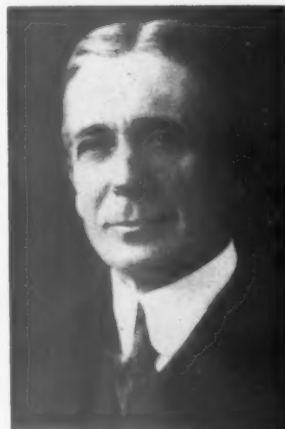
Mr. Ferry was born at Grand Haven, Mich., March 12, 1871, a member of a noted pioneer family of that state. Attracted by mining in his boyhood, he went to the Colorado School of Mines after he had completed his preliminary education in Michigan, and went from Colorado to Park City, Utah, where he obtained work in the mines at day wages and where his mining activities centered throughout the rest of his life.



W. MONT FERRY

He had made his home at Salt Lake City since 1898 and was active in the public life of the state. He was a member of the Salt Lake City council, president of the Utah State senate and was mayor of Salt Lake City in the World War period. He was president of the American Silver Producers Association, a member for many years of the American Mining Congress, the American Institute of Mining and Metallurgical Engineers, of the leading Salt Lake City clubs and many other national and local organizations. He was held in high and affectionate esteem by his Utah mining associates who, in recognition of his long and unselfish service at home and elsewhere, recently presented to him a watch inscribed "For distinguished service to the mining industry."

Mrs. Ferry, their twin sons, William Montague, Jr., and Sanford Truman Ferry, and two sisters of Mr. Ferry survive.



FRANK BLACK

FRANK B. BLACK, chairman of the board of directors, and one of the founders of the Ohio Brass Company, died suddenly of a heart attack at his home in Mansfield, Ohio, December 19 at the age of 72. Mr. Black was a pioneer in the electrical manufacturing industry, having organized the Ohio Brass Company in 1888. He was a leader in civic affairs as well as in the industrial field.

HERBERT H. TAYLOR, Chairman of the Board of the Franklin County Coal Corporation and for over 30 years a national figure in the coal industry, died December 27 after a long illness in Tucson, Ariz.

Mr. Taylor had retired from active business in February, 1934, because of ill health, but remained as President of the Franklin County Coal Corporation until July 1, 1935. At that time he became Chairman of the Board of the Franklin County Coal Corporation, and E. R. Keeler was promoted to the presidency.

WILLIAM H. THOMAS, a native of Oldham, England, who played an important part in the early mining operations in the Birmingham region, died in Birmingham December 30 at the age of 80.

During his long experience with the coal industry he was associated with the Woodward Iron Company, the DeBardeleben Coal Corporation at Payne's Bend, and later was superintendent at Corona until his retirement in 1930.

IVAN H. BARKDOLL, general superintendent of the Copper Queen Division of Phelps-Dodge Corporation at Bisbee, Ariz., died of a heart attack in Chicago, December 1 at the age of 61. Mr. Barkdoll started work at the Copper Queen in 1896, went to the Old Dominion at Globe in 1913 as general manager, and returned to the Copper Queen in 1933.

Captain JAMES J. O'BOYLE, President of the Pittston Company, died at Pittston Hospital December 28 at the age of 55 from injuries received in a fall while walking near his home in West Pittston.

JAMES R. CRAY, Uniontown attorney, banker and coal man, died in Pittsburgh December 11 at the age of

77. Mr. Cray pioneered in the development of the coal and coke industries in Fayette and Greene Counties and was interested in several large banks, including the National Bank of Fayette County, of which he was president.

WILLIAM P. TRENCH, who until his return from active business in 1936 had been associated with the American metal trade for 56 years, died in Brooklyn Christmas Eve at the age of 76.

ELI T. CONNER, dean of mining engineers of the Anthracite field and nationally known in connection with mining problems, died in a Scranton hospital January 3 at the age of 73.

Mr. Conner was a member of the John Hays Hammond Commission on underground repair problems and a pioneer in the movement of slushing or filling abandoned openings in mines



ELI T. CONNER

to protect the surface over mine workings. He was a life member of the American Mining Congress and a former head of the Anthracite Division of the American Institute of Mining and Metallurgical Engineers.

Wheels of Government

(Continued from page 69)

real activity on the O'Mahoney-Borah Federal Licensing Bill or the Wheeler-Anti-Basing Point measure.

Bituminous Coal Commission

Hearings this month before the Commission and investigators have been largely concerned with price adjustments which have been considered upon the petitions of coal producers in various areas. The situation is complex and difficult, but adjustments are being made and the tendency on the part of producers to go along with the Commission and the law continues. The Commission has recently ruled that information and data used in connection with the establishment of prices shall be made available to the Consumers Counsel. Such action had previously been deemed unwise as, under the Act, much of this information is of a confidential nature. The cases of a number of railroad coal companies who have petitioned to be relieved from complying with the provisions of the code have not as yet been decided, although it is difficult to understand how the tonnages of these captive producers can properly be thrown into the computations of

weighted average costs upon which the prices of the commercial producers are to be based.

On January 17 Governor Earle of Pennsylvania and Chairman C. F. Hosford, Jr., of the National Bituminous Coal Commission, conferred at the White House. On January 18 representatives of anthracite producers and mine workers met with the Pennsylvania Anthracite Commission and Governor Earle in Harrisburg. These conferences are significant as indicating a movement toward Federal control of anthracite production and marketing under the Guffey-Boland Bill similar to that now exercised over the bituminous industry. It is hardly to be expected that the producers of anthracite are at this time agreed as to the desirability of federal control, but the coming months of the present Congress may see action on the Guffey-Boland measure.

Silver Price

On December 30 the President signed the proclamation, effective December 31 at midnight, which set the new price for domestically mined silver at 64.64 cents per ounce. This was done under his authority to vary the seigniorage charge, which was increased from 40 to 50 percent, thereby reducing the price from 77.57 cents to

64.64 cents per ounce. Later the Treasury Department issued through the Silver Unit of the Bureau of the Mint regulations governing the Federal purchase of silver as well as the new forms of affidavits which are required from ore producers and smelters. The Treasury has announced that the purchases of silver from Canada and Mexico will continue.

Foreign Trade Agreements

The State Department on January 7 announced the intention to negotiate a trade agreement with the United Kingdom, Newfoundland and the British Colonial Empire. While this does not include the dominion of Canada, Australia, India or New Zealand, a treaty with Great Britain will of necessity affect our trade relations with these countries. Notice of intent to negotiate a trade agreement with Turkey was issued on January 12. On the United Kingdom agreement, February 19 is the closing date for the submission of briefs and applications for oral hearings, with public hearings opening March 14. On the Turkish agreement, February 9 is the closing date for the submission of briefs and applications to be held orally, with public hearings beginning February 23.

Both announcements made public a list of the products on which the United States will consider granting concessions. For the United Kingdom the items included lead pigments, zinc oxide and leaded zinc oxides, clays or earths, mica, graphite, feldspar, carbons and electrodes, iron, manganese ore, tungsten metal, tungsten carbide, tungstic acid, chrome metal, steel ingots, sheets, plates, etc., wire rope, aluminum and alloys, and brass and bronze tubes. The following are subject to fixation on the free list: chromite or chrome ore, anthracite coal, culm and slack, coke, coal-tar products, iridium, osmium, palladium, rhodium, and ruthenium, and native combinations thereof with one another or with platinum and sulphur in any form.

Under the Turkish announcement articles subject to fixation on the free list include: borax and borates of lime, soda, etc., chromite or chrome ore and emery ore.

Two hundred relief maps of the San Francisco Bay Area, showing the Golden Gate International Exposition as it will appear in 1939, are being constructed by the National Youth Administration.

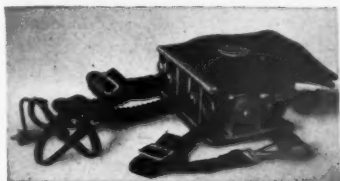
With the MANUFACTURERS

Atlas Powder Office

The Atlas Powder Company announces that Mr. J. H. Buchanan will have charge of the new sales office of the company located in the Field Building, 135 South La Salle Street, Chicago. Mr. Buchanan has had wide experience in explosive sales and service. The Chicago Office will service the complete line of Atlas industrial explosives and blasting supplies.

Oxygen Breathing Apparatus

Complete respiratory protection in any atmosphere for at least one hour under the most severe working conditions is afforded by the newly developed M. S. A. Lightweight One-Hour Oxygen Breathing Apparatus (approved by the U. S. Bureau of Mines under approval No. 1306).

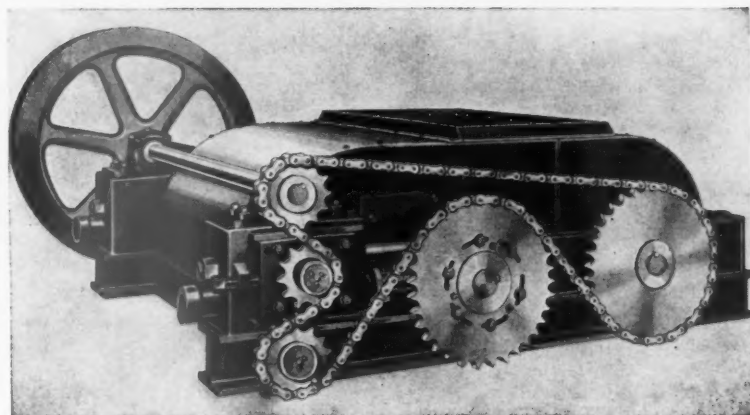


Weighing only 18 pounds, this lightweight apparatus is compact, carries comfortably and is positive and fully automatic in supplying the required amount of oxygen.

Descriptive literature may be had by writing this magazine, or addressing the manufacturer, Mine Safety Appliances Company, Braddock, Thomas and Meade Streets, Pittsburgh, Pa. Ask for bulletin No. BM-1.

Patent Right Acquired

Announcement is made by E. I. DuPont de Nemours and Company, Inc., that they have acquired the manufacturing and selling rights to the Hydraulic Blasting Cartridge covered by U. S. Patent No. 1808162.



Coal Crusher

A new Two-Roll Spring-Relief Coal Crusher, known as Chain Drive Type "C", has been developed and placed on the market by Link-Belt Company, Chicago. A number of these crushers have been installed, the manufacturer having preferred to withhold official announcement pending receipt of field tests of machines in service under a variety of conditions. The standard sizes include crushers with rolls of 26 in., 30 in. and 36 in. diameter.

Among the desirable features noted are: 1, simple, compact design, saving space; 2, unbreakable all-welded steel framework, combining lightness with strength; 3, ease of adjustment for any size of product, within the crusher range; 4, smooth, quiet operation; 5, low maintenance cost.

Tests and actual service have shown that more accurate sizing of the product is possible than with the usual two-roll crusher; and smaller fly wheels and higher speed motors can be employed. Compared with the older-type of two-roll adjustable crusher with 36 in. diam. rolls, and with long-tooth gears for connecting the two rolls, as much as 3 ft. 3 in. has been saved in head room on the new 36 in. size. Comparison with another 36 in. machine (having 48 in. long rolls)

showed a saving of 1 ft. 8 in. in width and 6 ft. 4 in. in length.

New catalog No. 1654, covering all sizes, will be sent to any reader upon request addressed to Link-Belt Company, 300 W. Pershing Road, Chicago, or other offices of the company.



Wire Rope Book

The American Cable Division of the American Chain & Cable Company, Inc., Wilkes-Barre, Pa., has issued an attractive 32-page book "Greater Dollar Value." Profusely illustrated with pictures of the "candid camera" type, the new book shows how to save time when installing new

lines; how the *preforming* process delivers a rope that is pre-broken-in; as well as informative data on how to overcome or minimize such rope-life-destroying elements as fatigue, uneven spooling, whipping, reverse bending, twisting in sheave grooves, kinking, porcupining, jerking and abrasion. In addition the new book is specific with respect to individual industries. It gives constructive, helpful information to oil drillers, loggers, miners, contractors, plant superintendents, building owners interested in elevator cable, and other rope users. Copies of the new book are available upon request.

Insulators

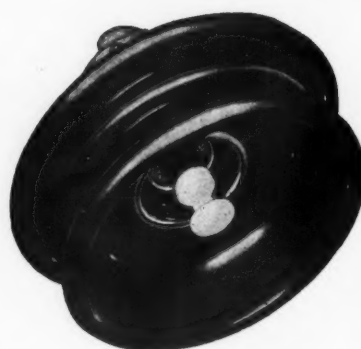
Provided with a clamp for holding the conductor in position, a line of three pintype insulators, developed by the Ohio Brass Company, Mansfield, Ohio, completely eliminates the need for tie wires. In addition to this feature, these insulators, known as clamptops, are free from radio interference at voltages 1.4 to 3 times normal line to ground voltages.

The clamptops have approximately the same cantilever strengths, flash-over values and leakage and arcing distances as the standard O-B multi-



"Clamptop"

part pintypes. The three sizes have 10½, 12 and 13½-in. diameters, and are for ordinary line voltages of 34.5, 46 and 69 kv., respectively. Two sizes of clamps can be furnished which, with the reversible keeper piece, allow the insulators to accommodate any conductor from ¼ to 1 in. Both clamps fit the three insulators, permitting complete interchangeability.



"Smogtype"

Another new type of suspension insulator, known as the Smogtype, has been developed by the Ohio Brass Company to provide satisfactory performance in districts exposed to fog or contaminating influences such as smoke, dust, cement, salt, oil spray and chemicals. Distinctive features are a long leakage distance, petticoating exposed to the weather, wide spacing between the outer petticoats, a deep metallized inner petticoat for flux control, a recessed cement matrix between porcelain and pin, a coupling arrangement which saves space and protects the cap from water dripping from the unit above, and high-strength sections. The results of these features are high surface resistance, self cleaning of exposed parts, freedom from radio interference, high resistance to corrosion, liberal clearances between units, high string length efficiency and less breakage from mechanical impacts.

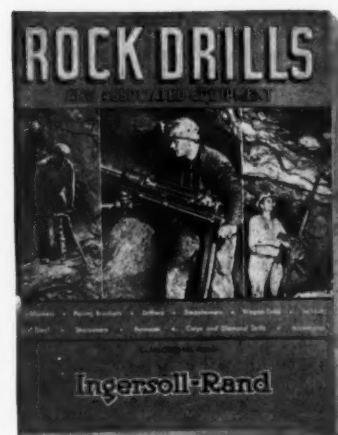
The shell has a 10-in. diameter and a 4-in. droop, allowing liberal clearances between adjacent units spaced at 6½ in. This prevents sparking from the cap of one insulator to the flange immediately above or below it and also helps to avoid short-circuiting by drip water between adjacent units near the lower end of long suspension strings. Exterior clearances between petticoats are wide to minimize inter-petticoat sparking and to facilitate cleaning, should this be necessary.

The Smogtype has a dry flashover value of 105 kv., a wet flashover value of 55 kv., a dry arcing distance of 9.6 in., a wet arcing distance of 4.7 in. and an M. & E. rating of 15,000 lbs. It is available with a socket cap and ball pin or with a clevis cap and pin.

Rock Drill Catalogue

A virtual encyclopedia of rock drills and associated equipment, including jackhammers, paving breakers, drifters, stopehammers, wagon drills, jackbits, drill steel, sharpeners, furnaces and blacksmith equipment including jack-rod threading devices, calyx and diamond drills, and accessories is presented in a new catalog, recently published by Ingersoll-Rand Company.

Representing one of the most complete tabulations of operating and physical characteristics on drills and drilling tools ever presented in one volume, the catalog is profusely illustrated with installation and shop



views of all the types of equipment presented, and in addition includes eight pages of such useful information as metric conversion tables, friction of air in pipes and hose, horsepower required to compress given quantities of air to specified pressures, and compressor capacities required to operate from one to seventy drills.

Copies of the catalog, Number 4201, are available from Ingersoll-Rand, 11 Broadway, New York City, or any of their branch offices.

Timken Engineers Advanced

Following the resignation of Ernest Wooler, Chief Engineer of The Timken Roller Bearing Company, A. L. Bergstrom has been appointed Executive Engineer to coordinate some of the varied engineering activities of the company. A graduate of the Royal Technical Institute of Sweden, Mr. Bergstrom spent several years with the Krupp organization in Germany. After a number of years in design

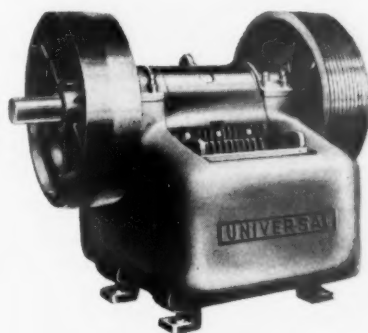
work in this country, he became connected with The Timken Roller Bearing Company in 1929 in the Works Engineering Department, advancing to the position of Chief Works Engineer, which position he filled until his appointment as Executive Engineer of the company.

With Mr. Bergstrom's appointment, the company also announced the following promotions in the several divisions: R. M. Riblet to be Chief Engineer of the Automotive Division, J. B. Baker to be Assistant Chief Engineer of the Automotive Division and Chief Engineer of the Rock Bit Division. S. M. Weckstein is appointed Chief Engineer of the Industrial Division, H. C. Edwards will be Chief Engineer of the Fuel Injection Equipment Division, W. C. Makley will be Chief Works Engineer, and E. J. Reagan, General Service Manager.

Crusher

The Universal Crusher Company of Cedar Rapids, Iowa, originators of the conventional overhead pitman type of bronze and roller bearing jaw crusher, and creators of many of the design and operating improvements in these equipments during the past thirty years, announces the first major design change since the inception of jaw crushers in 1906.

This new and revolutionary universal crushing unit, the manufacturer claims, possesses unusual strength from the streamlined frame, plus weight savings that approximate 20% over conventional types of crushers.



By reason of greater strength and lightness, the manufacturer states that big savings are effected in first cost, in shipping costs, in installation and operating costs. That the appearance of this new unit is pleasing to the eye is well illustrated by the 10 in. x 16 in. Universal Crusher pictured herewith.

A bulletin just issued on this new crusher, giving complete details, is available from the manufacturer at their office mentioned above, or from any of the company's distributors.

Elbow-Propeller Type Pump

A new line of elbow-propeller type circulating pumps to handle not only water but also semi-viscous liquids is offered by Worthington Pump and Machinery Corporation of Harrison, N. J.

These new pumps, compact and sturdy in design, may be installed in pipe lines for booster or circulating



service, the small number of vanes and large openings providing a large streamline flow channel. Internal bearings and ball-type thrust bearings are provided and the units are suitable for any type of drive.

The new line of pumps range in capacity from 1,000 to 2,000 g. p. m., at heads up to 20 feet.

New Type of Detonating Fuse

The Ensign-Bickford Company of Simsbury, Conn., will announce to the trade in the near future a new type of detonating fuse called Primacord-Bickford. This new product is the result of eight years of intensive research. During the past year Primacord has been tested in actual field work by several operators with perfect results.

Primacord-Bickford functions similarly to Cordeau-Bickford, which is now being used extensively by the quarrying and mining trade. Several improvements are to be noted in Primacord over Cordeau-Bickford. The explosive core in Primacord is P. E. T. N. (penta-erythrite-tetra-nitrate), which travels at a speed of 21,500 ft. per second against the speed of T. N. T. in Cordeau of 17,500 ft. per second. There is relatively no danger in the handling or storage of Primacord-Bickford. It cannot be set off by friction, fire or any ordinary shock, but must be detonated and this requires the use of a blasting cap attached to it.

The P. E. T. N. core is encased in textiles and water-proofing materials, which results in ease of handling due to lightness and flexibility. Only a simple square knot is required to join two lengths of the new detonating fuse, and branch connections are made with an easily tied double slip knot, which guarantees that the connections will be tight and at right angles to the main line. In addition, the textile covering offers sufficient tensile strength (113 lbs.) to withstand the strains encountered in the average loading operations.



Primacord-Bickford detonating fuse

Primacord weighs approximately 15 lbs. per 1,000 ft., which is about one-fifth the weight of Plain Cordeau. Its tensile strength is equivalent to that of Double Countered Cordeau. Thus, the one type of Primacord can be used for deep as well as shallow holes, and also for surface connections, replacing the several types of Cordeau that might be recommended for similar work.

Like Cordeau-Bickford fuse, Primacord-Bickford furnishes cheap insurance in safety. It saves labor costs by cutting down the time of loading and connecting holes, preparatory to making the shot. In the case of deck loads or broken charges, only one line of Primacord is necessary, whereas the use of caps would require the presence of one cap in each deck load. Better results are obtained from the explosives.

Primacord-Bickford meets all the requirements of a perfect detonating fuse. The ease in which it can be handled and the simplicity of application to almost any type of work with explosives broadens its possibilities in new fields over those of Cordeau-Bickford.

Shank and Bit Punch

The latest development in rock drill sharpening equipment, a new shank and bit punch, has just been announced by Ingersoll-Rand. New features include more convenient location of operating levers, safety guard for punch and improved design, facilitating inspection and reducing breakage of punch pins.



This punch, mounted on a sturdy one-piece bracket, is adaptable to all recent I-R Sharpeners. Descriptive literature, bulletin 2342, may be obtained from the Ingersoll-Rand Company, 11 Broadway, New York City, or any of their branch offices.



NATHAN R. BIRGE



CHARLES E. WILSON

General Electric Promotions

Nathan R. Birge, Assistant to the President of the General Electric Company since 1927, has been elected Vice President of the Company, according to a recent announcement by President Gerard Swope. Mr. Birge will be located in Schenectady, where he has carried on his duties in the past. He has been with the company since 1900.

Charles E. Wilson, Vice President in charge of General Electric's Appliance

and Merchandise Department since 1930, has been elected Executive Vice President of the company, a new position. Mr. Wilson has been with General Electric and one of its constituent companies, Sprague Electric, since 1899.

At the same time Mr. Swope announced the election of Philip D. Reed as Assistant to the President. Mr. Reed entered the employ of General Electric in 1926 and since 1934 has been general counsel in the lamp department with offices in New York.

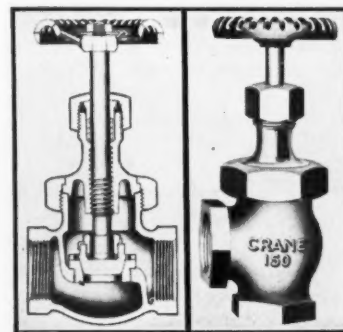
All-Wheel-Drive Vehicles

The 1938 Marmon-Herrington line of all-wheel-drive vehicles includes fifty-six models and represents the most complete line of such units on the market, according to announcement by the Marmon-Herrington Company, of Indianapolis, Indiana.

In addition to the regular line of more than 30 extra heavy duty Marmon-Herrington all-wheel-drive trucks, trailer-tractors, etc., the company also converts all Ford trucks, commercial and passenger cars for all-wheel-drive in its Indianapolis plant. The Marmon-Herrington Company began conversion of Ford V-8 trucks and passenger cars into all-wheel-drive vehicles in 1932.

Brass Globe and Angle Valves

For severe service on small lines carrying steam, hot water, cold water, oil, gas and similar fluids, Crane Co., Chicago, is offering a line of brass globe (No. 14-1/2-P) and angle (No.



LEFT—Brass globe valve. RIGHT—Brass angle valve

16-1/2-P) valves with plug type disc of Crane nickel alloy and body seat ring made of Exelloy, a specially heat treated chromium iron. This combination of metals is considered ideal for seating surfaces, having excellent resistance to wear, temperature galling and scoring. They are harder, stronger and tougher than metals ordinarily used in brass valves.

These valves are similar to the

Crane 14-P and 16-P brass valves and if any users of the latter should want to convert them to the new line, all that is necessary is to secure new discs and seats, all parts being interchangeable.

or they may be remotely located. Full supervision of operation is built into the amplifier so that failure of tubes, transformer, relay or coil system is immediately revealed. A micro-control permitting easy adjustment of sensitivity of the search system is standard.

of 300 ft., and produces a $\frac{7}{8}$ -in. core. Air, gas, or electric drive is available. 12 pages.

Metal Detector

The "Alnor" Forewarn Detector Equipment, manufactured by Illinois Testing Laboratories, Inc., Chicago, Ill., has been modified and adapted and is now offered for industrial use to detect the presence of tramp iron or steel in various products or materials.

Wherever it becomes essential to locate concealed iron and steel of any form, whether it be in a continuous or intermittent process, the Detector may be used advantageously. In a simple intermittent search process, bundles or packages of material are passed by hand through the search coil for examination. They are not left in the search coil opening, but merely passed through as one would pass a package over a counter. Presence of iron is announced by a visible and

Allis-Chalmers Organization Changes

Allis-Chalmers Manufacturing Co.'s publicity department for power, electrical and industrial machinery now has two sections, effective since January 15.

Mr. George Callos has been appointed assistant manager in charge of sales promotion embracing advertising, bulletins, exhibitions, house organs, etc. Mr. A. K. Birch has been appointed assistant manager in charge of market analysis, sales organization service embracing price books, data and sales information, and the distribution of literature.

• **EXPLOSIVES.** *Atlas Powder Company*, Wilmington, Del. The very attractive book, "Twenty-five Years," is an anniversary volume comprising a description of some of the Atlas products, views of the Atlas plants and research laboratories, and pictures of Atlas employes who have been with the company continuously for the last twenty-five years. The book is profusely illustrated with excellent photographs. 64 pages.

• **LIGHTING EQUIPMENT.** *Benjamin Electric Manufacturing Company*, DesPlaines, Ill. Catalog No. 26, a loose-leaf book, presents data on the latest improvements and lighting developments during the past year, and details a vast number of specifications, engineering recommendations, floor lay-out plans, intensity formulae, cost and labor-saving hints, lighting efficiency curves and installation illustrations. 352 pages.

• **POWER EQUIPMENT.** *Troy Engine & Machine Co.*, Troy, Pa. Bulletin 101 presents summarized data showing how 43 leading plants are obtaining power at an average cost of only $\frac{1}{2}$ c per kilowatt hour. 12 pages.

• **POWER TRANSMISSION EQUIPMENT.** *Carey Machinery and Supply Company*, 119-121 East Lombard Street, Baltimore, Md. Catalog No. 52 presents complete information on all Boston Power Transmission Equipment, and supersedes all previous editions. 320 pages.

• **TRACTORS.** *Caterpillar Tractor Co.*, Peoria, Ill. A new folder, Form 4496, is a pictorial presentation of unusual obstacles that have been overcome by the use of "Caterpillar" Diesel Engines, track-type tractors or road machinery from Alaska to Zanzibar.

• **TRUCK TRANSPORTATION.** *Marm-Herrington Co., Inc.*, Indianapolis, Ind. Pamphlet describes Marm-Herrington All-Wheel-Drive trucks. 6 pages.



audible signal. Fully automatic protection can be obtained by installing metal detectors on conveyor belts. Presence of tramp iron on the belt causes a momentary reversal of the conveyor system with a consequent discharge of the contaminated material.

The Detector consists of three distinct parts: the search coil, the amplifier, and the supervisory signals. Amplifier and signals may be made an integral part of the coil system,

CATALOGS and BULLETINS

• **ALLOY STEELS.** *The International Nickel Co., Inc.*, 67 Wall Street, New York, N. Y. Bulletin U-3 describes applications of nickel-alloy steels for hand tools. 16 pages.

• **CHAINS AND CABLES.** *American Chain and Cable, Inc.*, Bridgeport, Conn. New convenient reference booklet, "Acco Products," presents a comprehensive index of over 200 different Acco Products, gives a breakdown of Acco Divisions and the products manufactured by each Division, and shows a list of sales offices and warehouses for speedy handling of orders. 12 pages.

• **DRILLING EQUIPMENT.** *E. J. Longyear Co.*, Minneapolis, Minn. Bulletin No. 52 describes various types of prospector diamond core drills and the Longyear Pneumatic Rod Puller. The prospector drill is for surface or underground core drilling to depths

THE PURE

PURE THREE POINT LUBRICATION



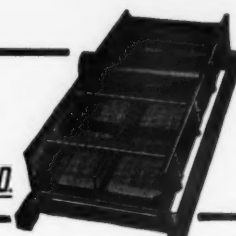

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OF INDUSTRIAL
PETROLEUM PRODUCTS


OIL CO.

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The Best in Vibrating Screens—yet priced Surprisingly Low. A Tried, Proved and Guaranteed Product. Write for Latest Screen Catalog Today.

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